Nokia Customer Care

6(b) - RF Troubleshooting Instructions

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General Information on RF Troubleshooting

Notes:

Several bills of material (BOM): There are two different kinds of VCOs, VCTXOs, RF-PAs, SAW-filters and Antenna Switches (ASM) assembled. They may only be replaced with the same type as the original component (from the same manufacturer).

Phoenix version: In this document there are example measurements being depicted with pictures of AMS-Phoenix, version A 2004.06.1.69. In later versions pictures of menus and windows may look differently.

Layout version: The drawings of test points and component placement in this version of the document are taken from build B4.0 layout (1gqa_41a). If you use the document for newer layout versions, make sure to use the corresponding assembly and test point drawings.

Test environment

It is assumed, that the phones are disassembled and tested with a repair jig MJ-22R.

The following measurements have to be done for repairing the phone boards:

- **RF measurements** shall be done using a spectrum analyzer together with a high-frequency probe. Note that the signal will be significantly attenuated. Correct attenuation can be checked using a “good” phone board for example.
- **LF (low frequency) and DC measurements** shall be carried out with an oscilloscope together with a 10:1 probe.
- For **receiver measurements,** a signal generator specified for frequencies up to 2000 MHz is required. The signal generator is connected to the antenna port of the repair jig.
  Most of the radio communication testers, like CMU200, can be used as a signal generator, but make sure to have a continuous (CW) signal without modulation for alignment purposes.
- **Transmitter output level measurements** shall be done with a power meter which is connected to the antenna port of the repair jig.

Always make sure that the measurement set-up is calibrated when measuring RF parameters at the antenna port. Remember to put the correct losses of the module repair jig and the connecting cable in Phoenix or in the set-up programs of the RF generators when realigning the phone.

Apart from key-components described in this document, there are a lot of discrete components (resistors, inductors and capacitors) for which troubleshooting has to be done by checking its proper soldering and complete assembly on the PWB. Capacitors and resistors can be checked by means of an ohm-meter, but be aware in-circuit measurements should be evaluated carefully.

Test conditions

Rx tuning of the 26 MHz reference oscillator (VCTCXO) is temperature sensitive because of the estimations of <AFC_value> and <AFC_slope>. According to the Production Test Specification DCS02294-EN-0.5, the ambient temperature has to be within a temperature range of 22°C to 28°C.

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Most RF semiconductors are static discharge sensitive. ESD protection must be taken into account during repair (ground straps and ESD soldering irons).

The RF ASIC Helgo is moisture sensitive. Therefore, the ASIC must be pre-baked prior to soldering.

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Receiver Verification and Troubleshooting

General instructions for RX troubleshooting

Connect the phone to a PC, which has Phoenix Service Software and a dongle installed, using either

- repair jig and DAU-9S (RS232) cable or
- repair jig and XCS-4 cable via FPS-8 Flash Box or
- DAU-9T cable (RS232).

Connect the phone to a power supply (DC voltage: 3.6V, max. current: 3A) and an RF signal generator. Switch the phone on.

Start Phoenix Service Software and open FBUS connection.

Select	Scan Product		Ctrl-R

and wait until the phone information (RM-94) is shown in the lower right corner of the screen.

Follow the instructions below.

Measuring RX I/Q signals using RSSI reading

Start Phoenix Service Software and open FBUS connection.

Select	Scan Product		Ctrl-R

Wait until the phone information is shown in the lower right corner of the screen.

Set the operating mode to local mode

Select	Testing		T
		RF Controls	F
Select	Band	GSM 900 or GSM1800 or GSM1900	
	Active unit	RX	
	Operation mode	Burst	
	RX/TX Channel	37 or 700 or 661	
Select	Testing		T
		RSSI reading	R

In the RSSI Reading window, the <measuring mode> shall be set on **Sum vector** and the <reading mode> on **Continuous**.

The set up should now look like this:

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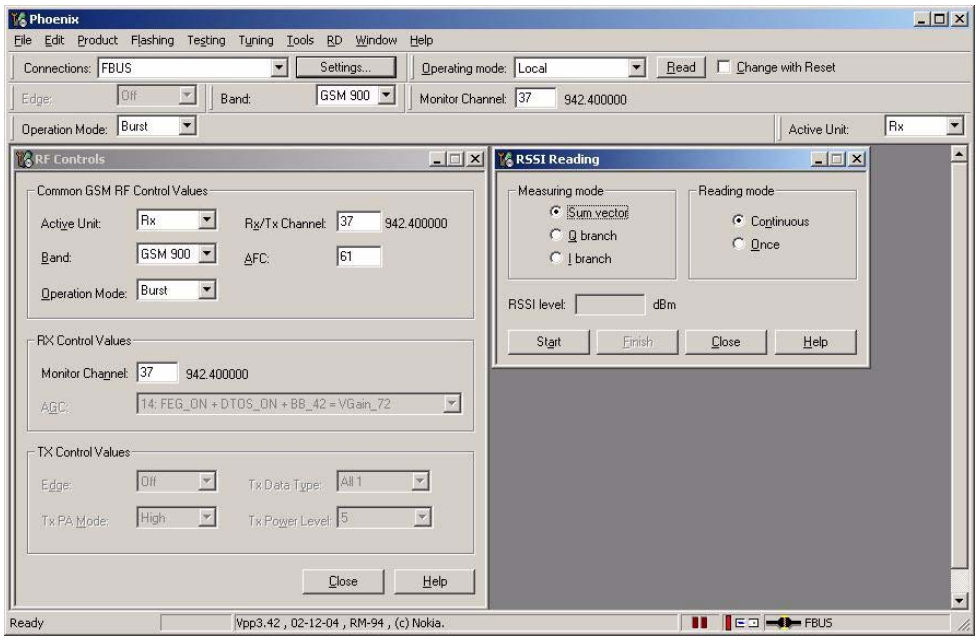
(The example below shows a screen shot in GSM900!)



Make the following settings on your signal generator:

Frequencies:

- GSM 900: 942.46771 MHz (channel 37+ 67.710 kHz offset)
- GSM 1800: 842.86771 MHz (channel 700 + 67.710 kHz offset)
- GSM 1900: 1960.06771 MHz (channel 661+ 67.710 kHz offset)

RF power level:

- – 80 dBm @ the antenna connector of the phone/ test jig (remembering to compensate for the cable and jig attenuation).

Click on <Read now> in RSSI reading.

The resulting RSSI level shall be – 80 dBm +/– 0.5 dB in each band.

Measuring RX performance using SNR measurement

Start Phoenix Service Software and open FBUS connection.

Select	Scan Product		Ctrl-R

Wait until the phone information is shown in the lower right corner of the screen.

Set operating mode to <local mode>.

Select	Testing		T
		RF Controls	F
Select	Band	GSM 900 or GSM1800 or GSM1900	
	Active unit	RX	

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	Operation mode	**Burst**	
	RX/TX Channel	37 or 700 or 661	
Select	Testing		T
		SNR Measurement	M
Select	Measuring mode	Fast SNR (Radio Button)	
Press	Start		

The window <Signal Measurement> pops up informing on **frequency** and **power level** of the signal generator to be set. Follow the command <Turn ON the RF generator>.

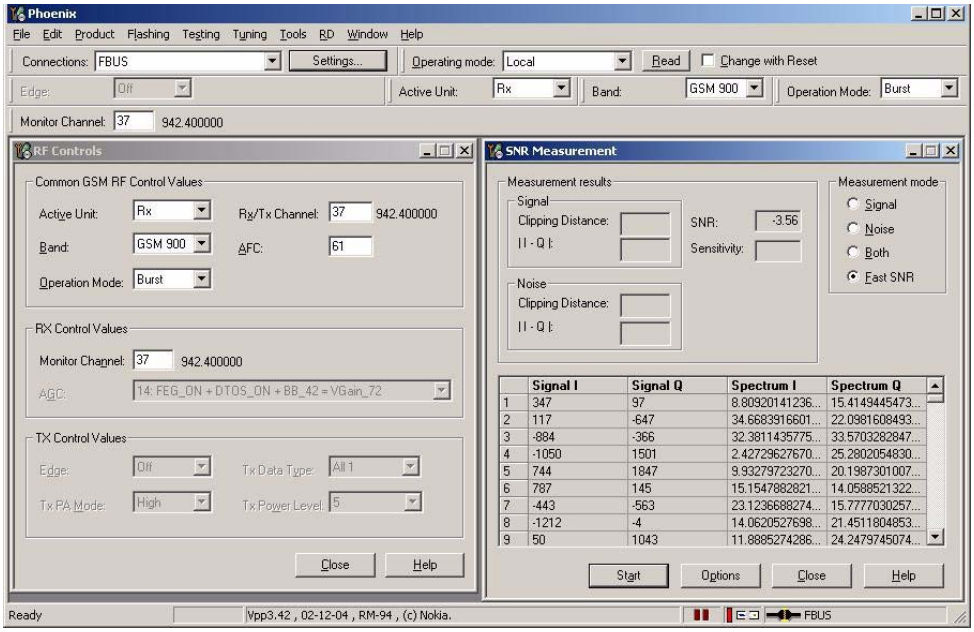
Press <ok> and the window will close.

Read the SNR result from the window SNR Measurement. The value shall exceed:

- GSM 900: > 20 dB
- GSM 1800: > 18 dB
- GSM 1900: > 18 dB

The set up should now look like this:

(The example below shows a screen shot in GSM900!)



Choose the remaining GSM bands and measure accordingly the procedure described above.

Measuring front-end power levels using spectrum analyzer

Spectrum analyzer (SA) level values depend on the probe type and shall be verified by a properly working phone sample. The levels that are given in this document are measured with a resistive probe (50 Ohm semi-rigid cable).

Start Phoenix Service Software and open FBUS connection.

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Select	Scan Product		Ctrl-R

Wait until the phone information is shown in the lower right corner of the screen.

Set <operating mode> to <local mode>.

Select	Testing		T
		RF Controls	F
Select	Band	GSM 900 or GSM1800 or GSM1900	
	Active unit	RX	
	Operation mode	Continuous	
	RX/TX Channel	37 or 700 or 661	

Please refer to the fault finding chart and Appendix for proper levels at different test points.

Measuring analogue RX I/Q signals using oscilloscope

Measuring with an oscilloscope RX I and RX Q signals on the test points <RXI> respectively <RXQ> is recommended only if the RSSI reading does not provide enough information. Input level = -60dBm.

Start Phoenix Service Software and open FBUS connection.

Select	Scan Product		Ctrl-R

Wait until phone information is shown in the lower right corner of the screen.

Set operating mode to <local mode>.

Select	Testing		T
		RF Controls	F

Wait until the RF Controls window pops up.

Select	Band	GSM 900 or GSM1800 or GSM1900	
	Active unit	RX	
	Operation mode	Continuous	
	RX/TX Channel	37 or 700 or 661	
	AGC	10	

The following picture should be displayed on an oscilloscope's screen if the receiver is working properly:

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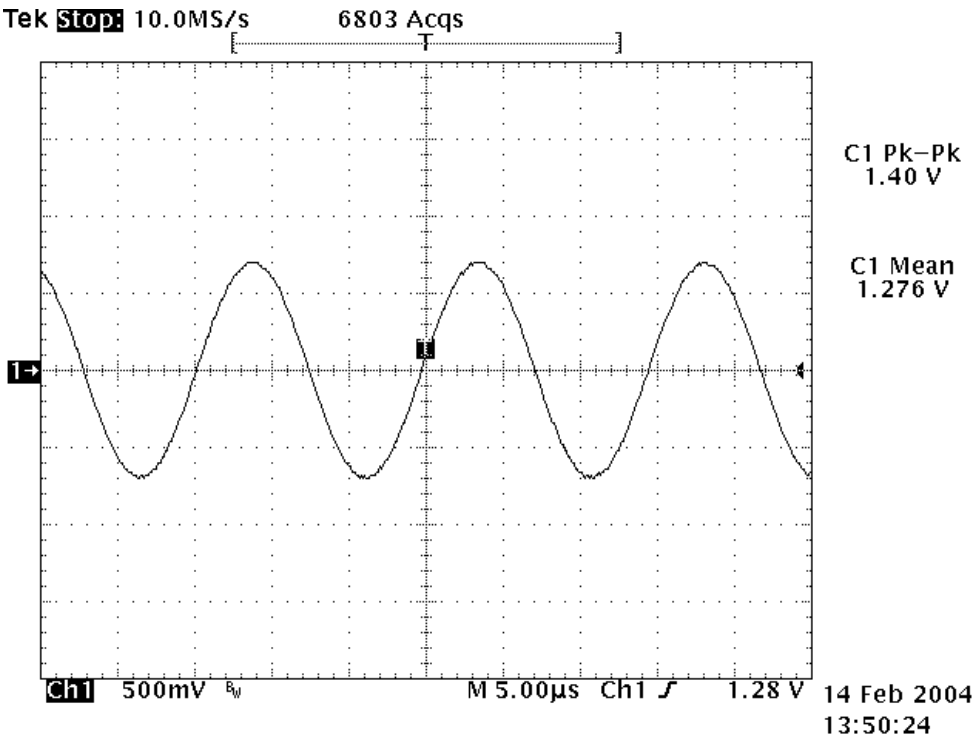

Signal amplitude	1.40Vpp
DC offset	[a] 1.28V as the offset is floating, switch to the operating mode <Burst> in Phoenix and read the DC offset
Frequency	67kHz

Fault finding chart of the receiver

During fault finding, the calibration procedure is used to find out, whether all bands are affected (error in common part of the Rx chain) or only one band (error in a Rx part of the failed band). **Take care not to save calibration values to the phone memory, which are out of limits. Find the error first and repair it.**

When a defective phone has been calibrated, a possible error in RX front-end might be masked. In that case, one can get a reasonable RSSI reading, although the front-end shows excessive losses. If it is not sure that incorrect re-calibration has been made, following steps shall be carried out:

- Check if AGC calibration is within limits.
- Check if SNR reading is o.k.

Use an oscilloscope to check levels of “RXI” and “RXQ”.

The RF ASIC generates only single ended I and Q signals (RXI, RXQ). As the A/D converter in UEM requires two differential signals, an artificial mid voltage is generated from VrefRF02. The phone layout has dedicated test points for the analogue RX I and Q signals (J512, J513).

The BB part is used to measure those signals by means of RSSI reading. This works only if correct calibration has been carried out in production.

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RSSIreading [dBm] = $20\log(U_{BB}/U_{LSB}) - AGC_{calibrated}$

In order to check the levels and frequencies of RF signals, the following probe can be used (note that only the core lead contacts the test point, the shielding of the coaxial cable does not contact GND during the measurement):

Connect this probe via a coaxial cable and a DC block to a spectrum analyzer. The **DC block is important** to protect the spectrum analyzer from DC levels, which superpose the RF signal at several test points.

If both RX *and* TX path seem to be faulty, it has to be checked if the synthesizer is working.

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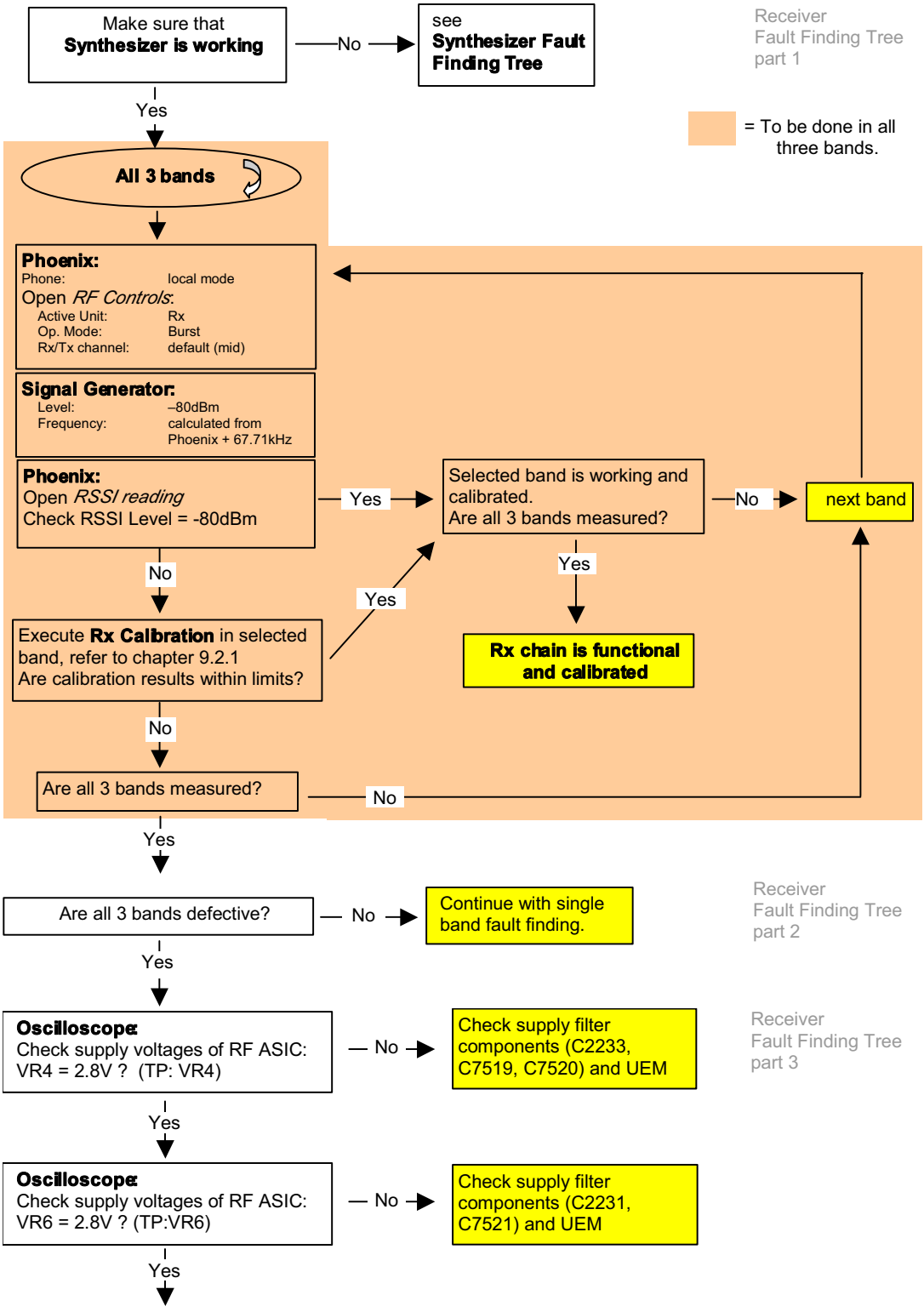

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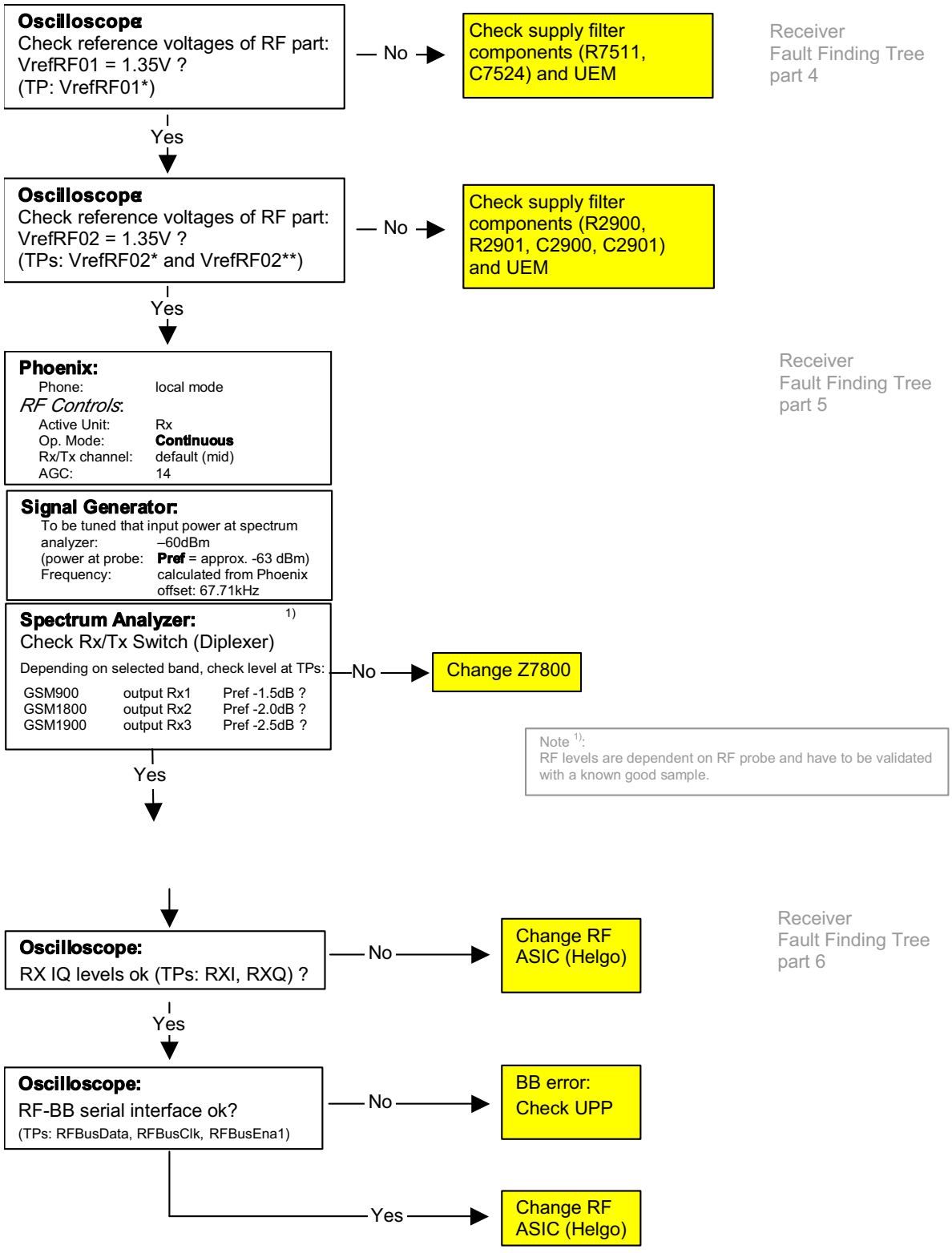

Receiver Fault Finding Tree part 4

Receiver Fault Finding Tree part 5

Note 1):
RF levels are dependent on RF probe and have to be validated with a known good sample.

Receiver Fault Finding Tree part 6

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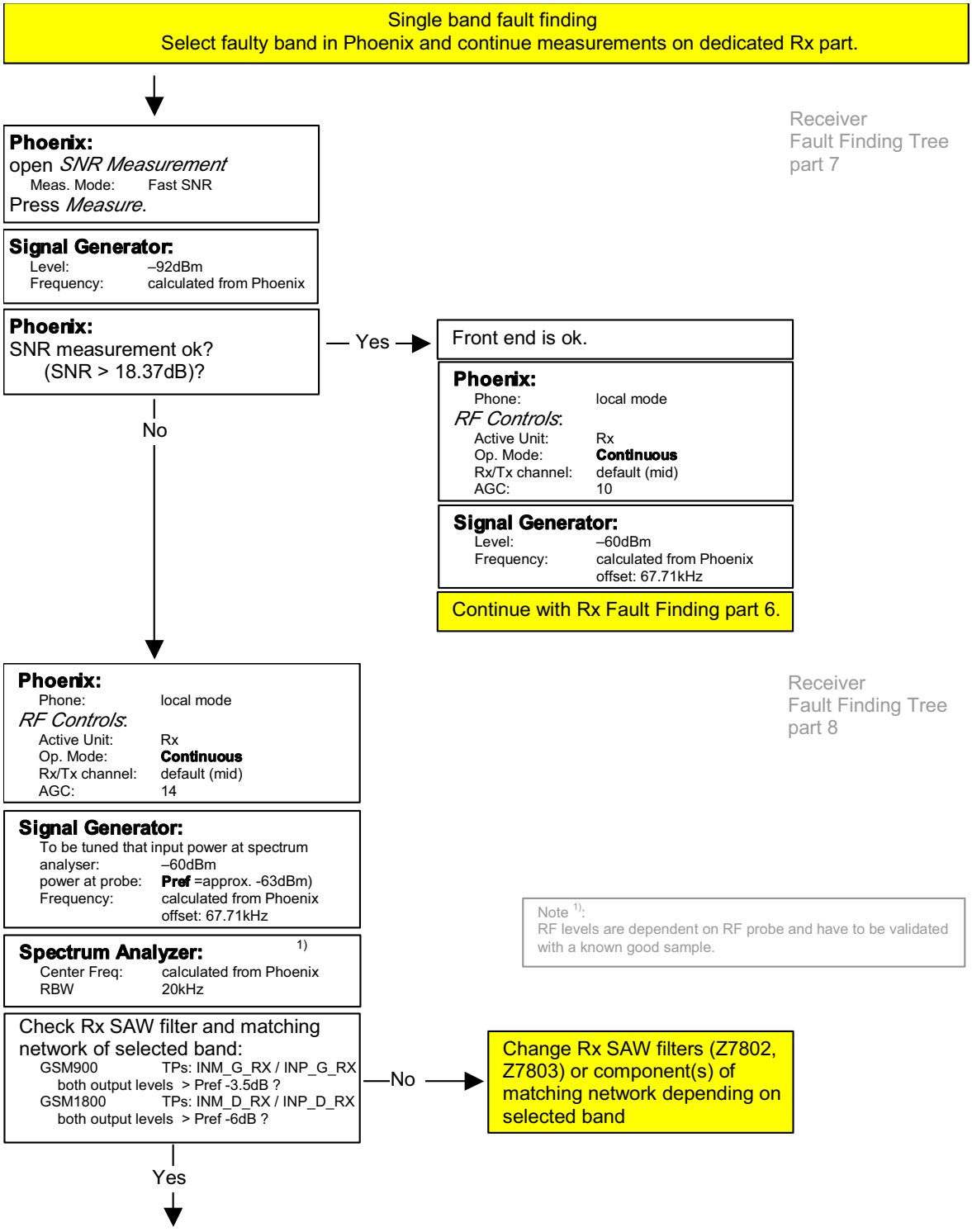

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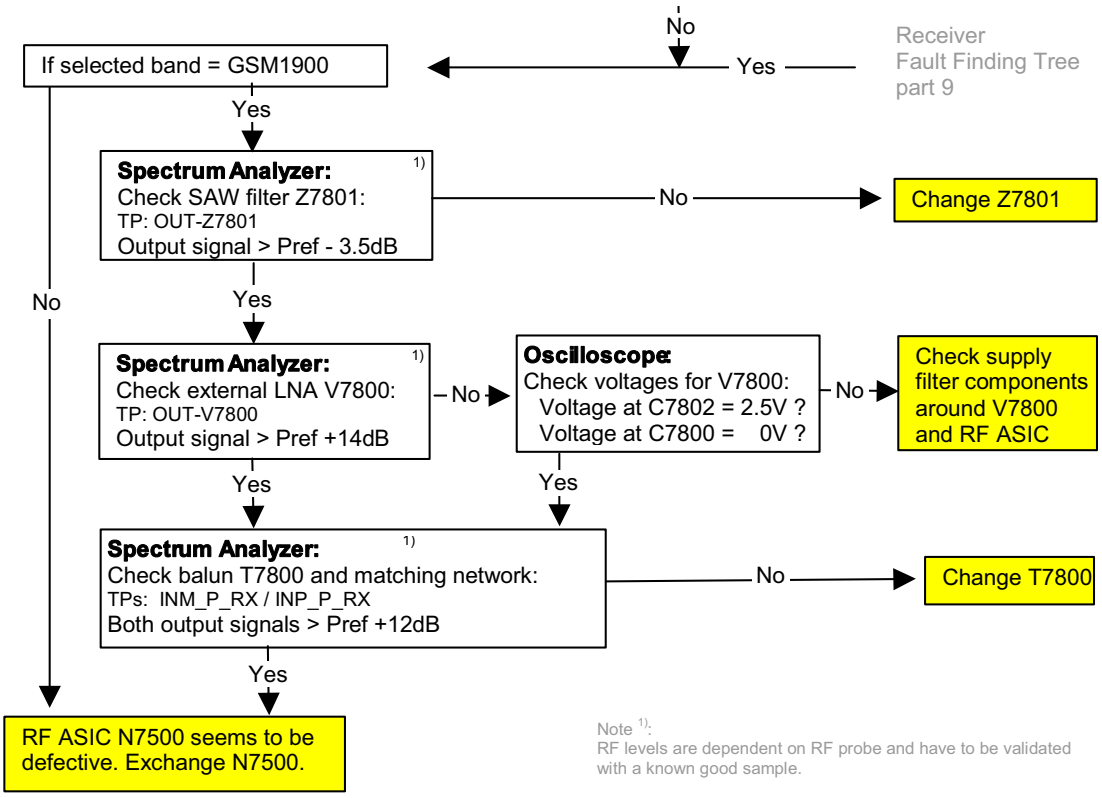

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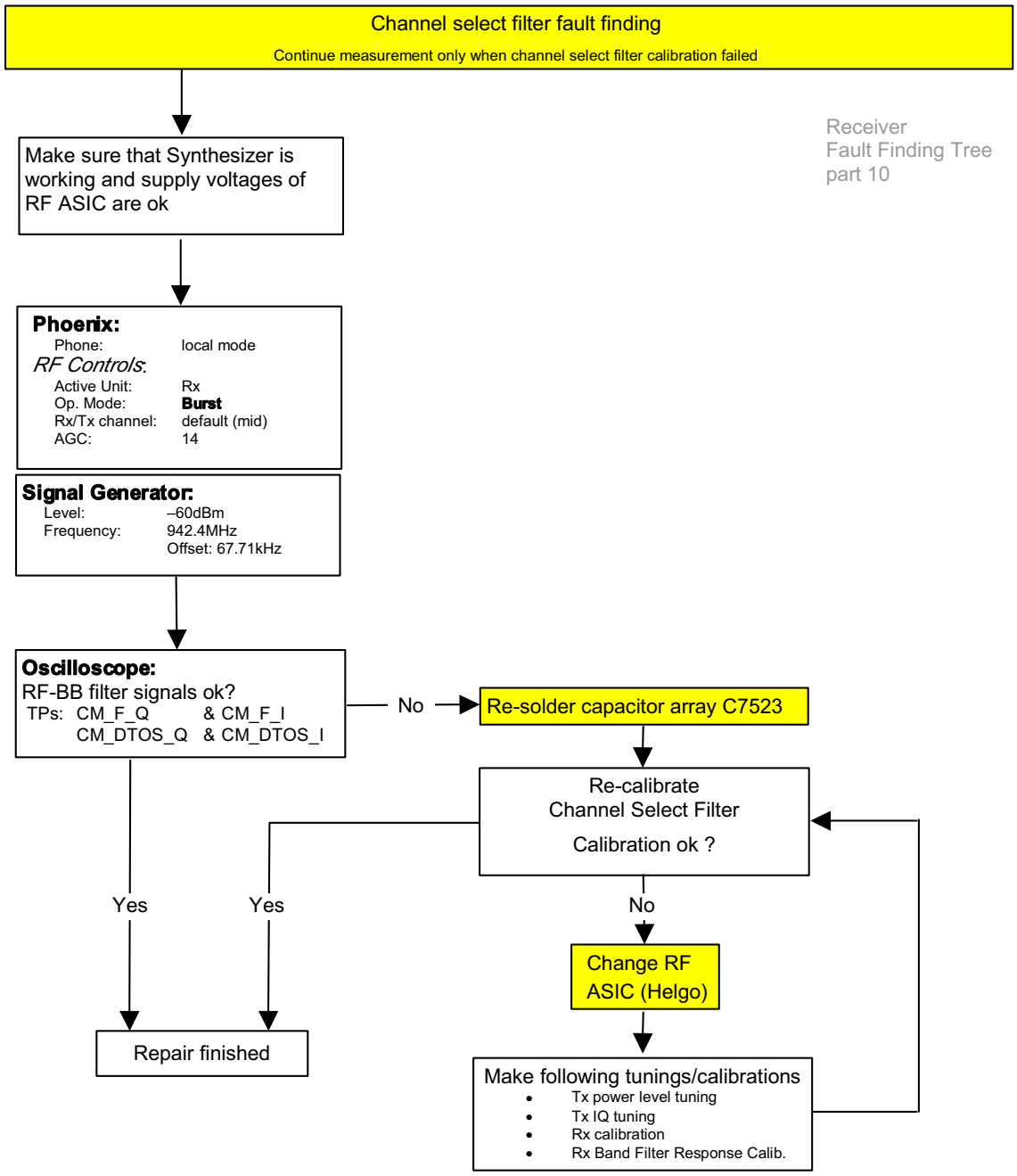

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Transmitter

General instructions for TX troubleshooting

Connect the phone to a PC, which has Phoenix Service Software and a dongle installed, using either

- repair jig and DAU-9S (RS232) cable or
- repair jig and XCS-4 cable via FPS-8 Flash Box or
- DAU-9T cable (RS232)

Connect the phone to a power supply (DC voltage of **3.6V**) and switch the phone on. The value of the DC voltage of 3.6V at the phone battery connector is crucial.

Connect an RF cable between the test jig and the measurement equipment (GSM test equipment, power meter, spectrum analyzer, or similar).

Make use of an adequate attenuator at the input of your measurement equipment (10dB to 20dB are recommended for a spectrum analyzer or a power meter). Additionally, a DC block is recommended. Assure not to overload or destroy the equipment.

It is strongly recommended to use TXP as external trigger for all TX tunings. External triggering gives the following advantages:

- trigger for spectrum analyzer (gated sweep)
- trigger for oscilloscope
- trigger for power meter (avoid exchanging of attenuator and getting better accuracy in power measurements)

Start Phoenix Service Software and open FBUS connection:

Select	Scan Product	Ctrl-R

and wait until the phone information is shown in the lower right corner of the screen.

Follow the instructions in the chapters below.

GSM900 transmitter

General instructions for GSM900 TX troubleshooting

Start the preparations as described in chapter “General instructions for TX troubleshooting”.

GMSK

Set operating mode to local mode.

Select	Testing	RF Controls
Wait until the RF Controls window pops up		
Select	Band	GSM 900
	Active unit	TX

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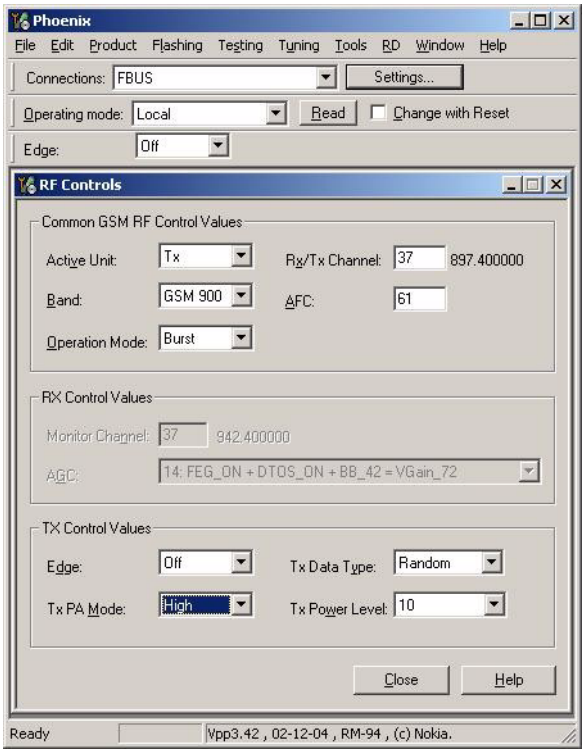
Operation mode	Burst
RX/TX Channel	37
TX Power Level	10
TX Data Type	Random
Edge	Off

The setup should now look like this:



Now the measurement equipment should detect the following output signal of the phone:

P_{out} = +23dBm @ 897.4 MHz

If this is not the case, go to the GMSK fault finding chart for the GSM900 transmitter.

EDGE

Set operating mode to local mode.

Select	Testing	RF Controls

Wait until the RF Controls window pops up.

Select	Band	GSM 900
	Active unit	TX
	Operation mode	Burst

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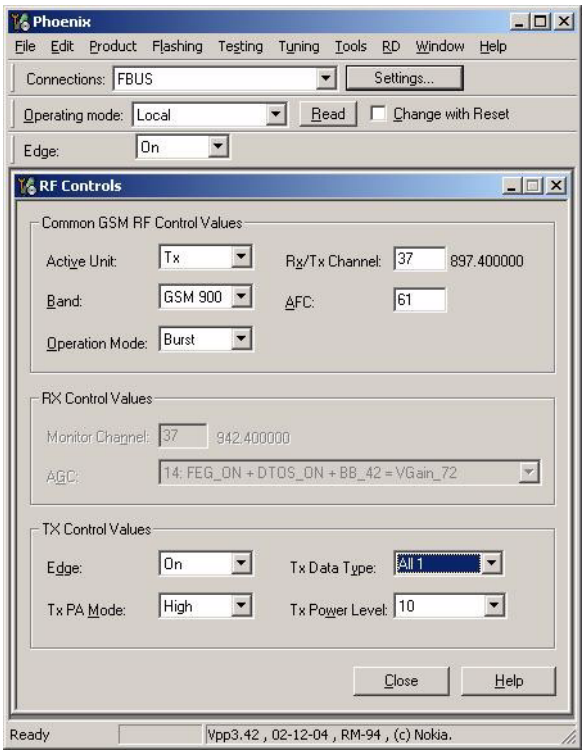
RX/TX Channel	37
TX Power Level	10
TX Data Type	All1
Edge	On

The setup should now look like this:



Now the measurement equipment should detect the following output signal of the phone:

P_{out} = +24.5 dBm @ 897.4 MHz

If this is not the case, go to the EDGE fault finding chart for GSM900 transmitter.

Fault finding chart for GSM900 transmitter

In the following, it is assumed that the TXP signal is used as trigger signal. For that, a TXP test point is provided.

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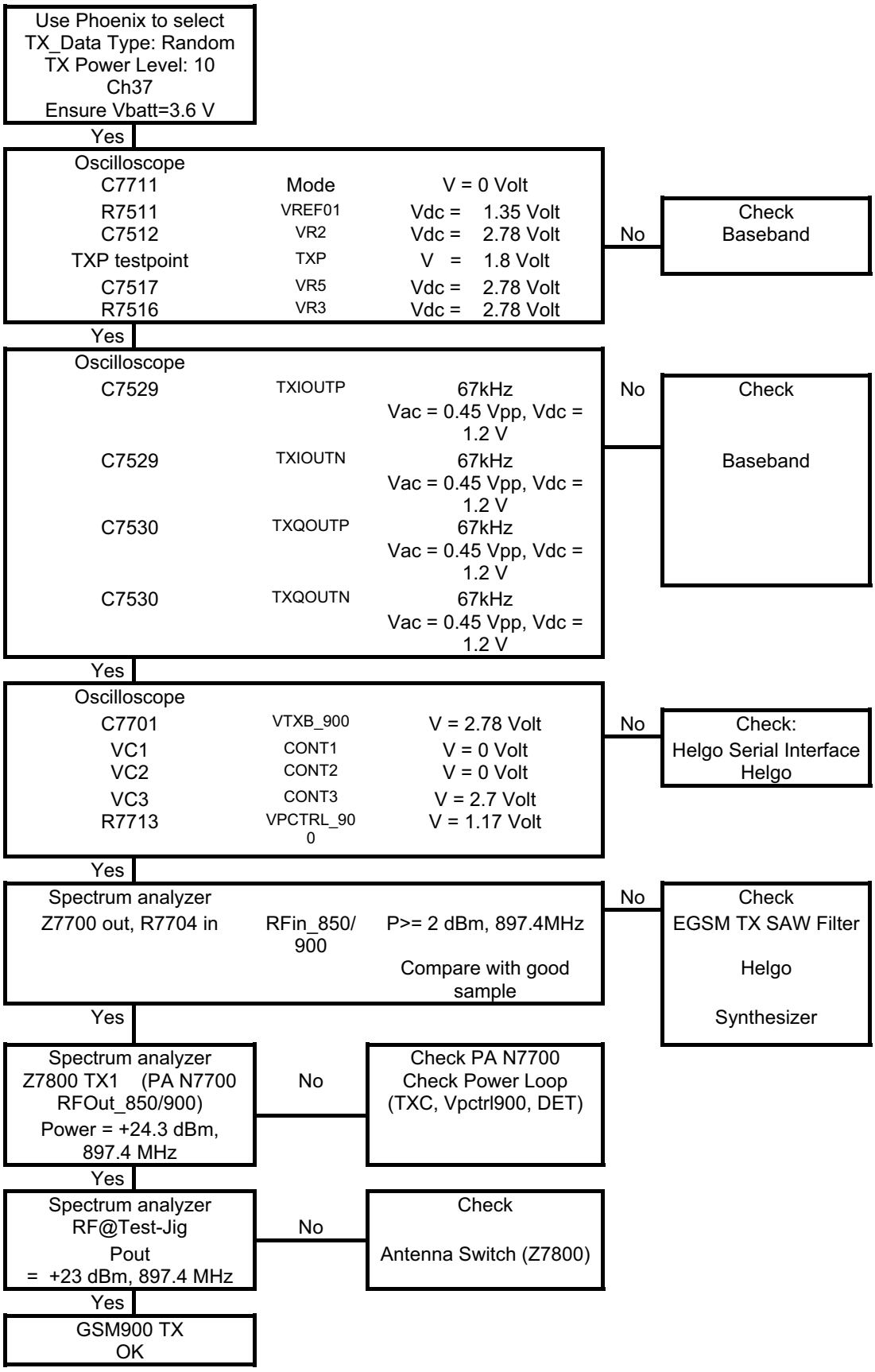
GMSK



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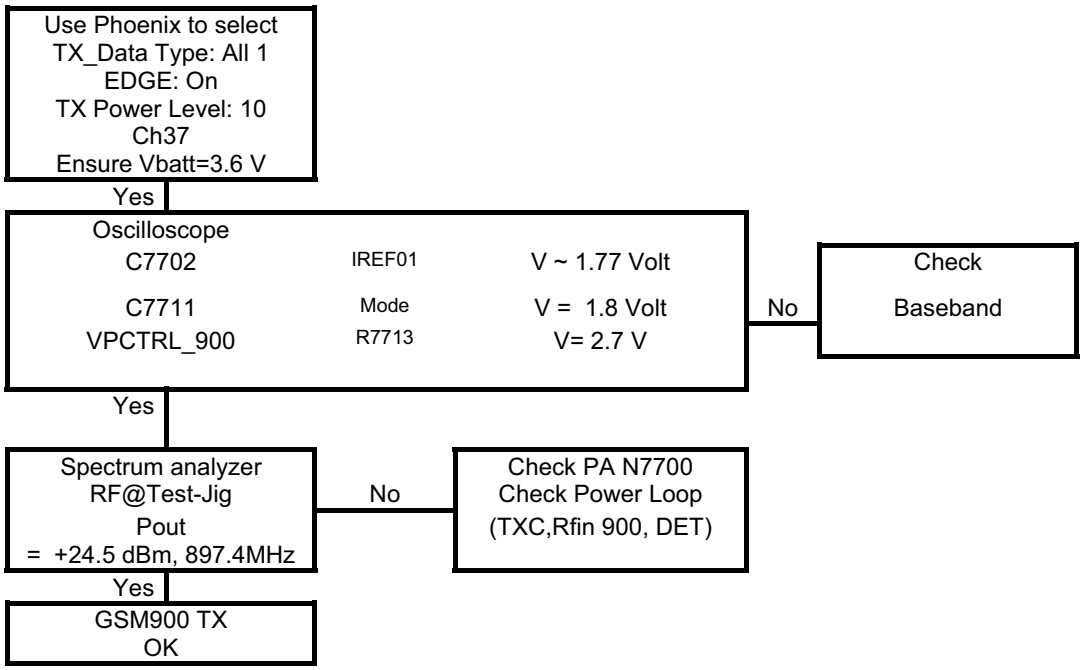
EDGE

Ensure that GMSK is ok.



GSM1800 transmitter

General instructions for GSM1800 TX troubleshooting

Start the preparations as described in chapter “General instructions for TX troubleshooting”.

GMSK

Set operating mode to local mode.

Select	Testing	RF Controls

Wait until the RF Controls window pops up

Select	Band	GSM 1800
	Active unit	TX
	Operation mode	Burst
	RX/TX Channel	700
	TX Power Level	5
	TX Data Type	Random
	Edge	Off

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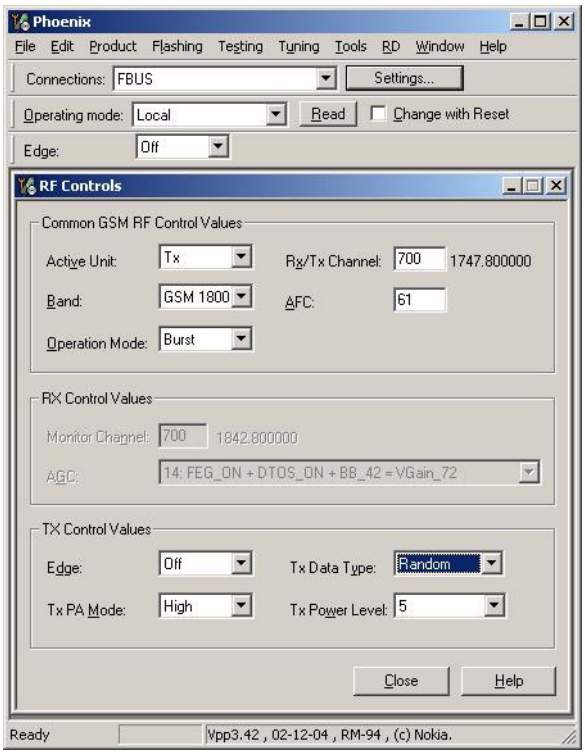
The setup should now look like this:



Now the measurement equipment should detect the following output signal of the phone:

P_{out} = +23dBm @ 1747.8 MHz

If this is not the case, then go to the GMSK fault finding chart for GSM1800 transmitter.

EDGE

Set operating mode to local mode.

Select	Testing	RF Controls

Wait until the RF controls window pops up.

Select	Band	GSM 1800
	Active unit	TX
	Operation mode	Burst
	RX/TX Channel	700
	TX Power Level	5
	TX Data Type	All 1
	Edge	On

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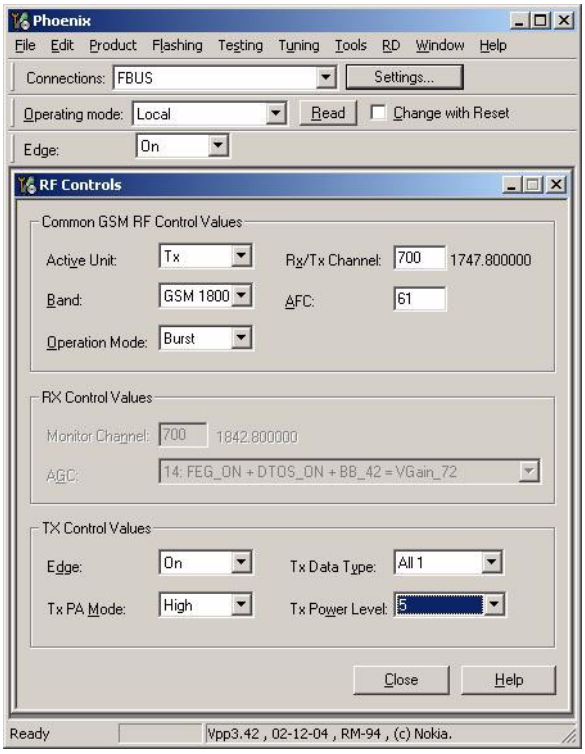
The setup should now look like this:



Now the measurement equipment should detect the following output signal of the phone:

P_{out} = +21.5 dBm @ 1747.8 MHz

If this is not the case, then go to the EDGE fault finding chart for GSM1800 transmitter.

Fault finding chart for GSM1800 transmitter

In the following, it is assumed that the TXP signal is used as trigger signal. For that, a TXP test point is provided.

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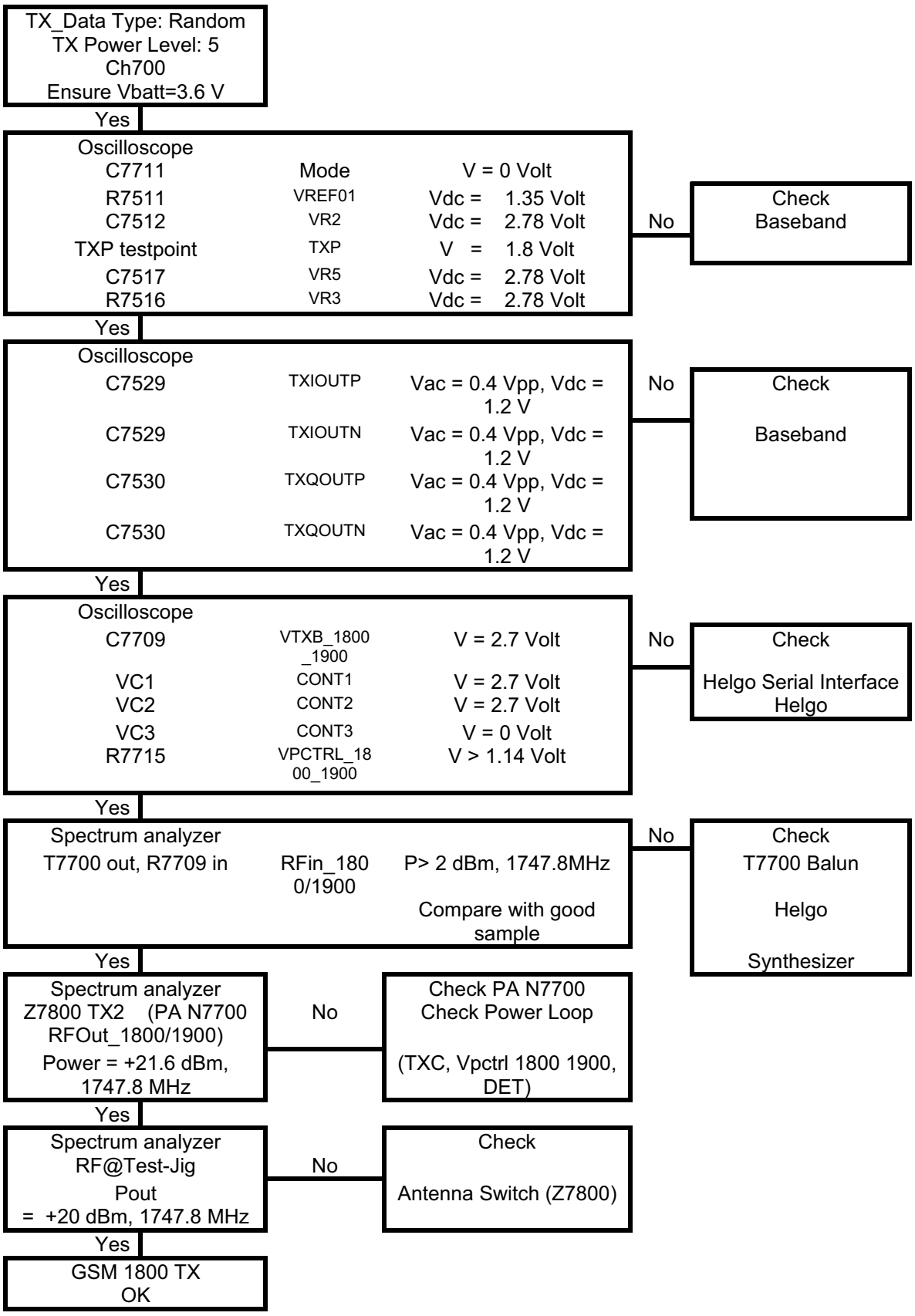
GMSK



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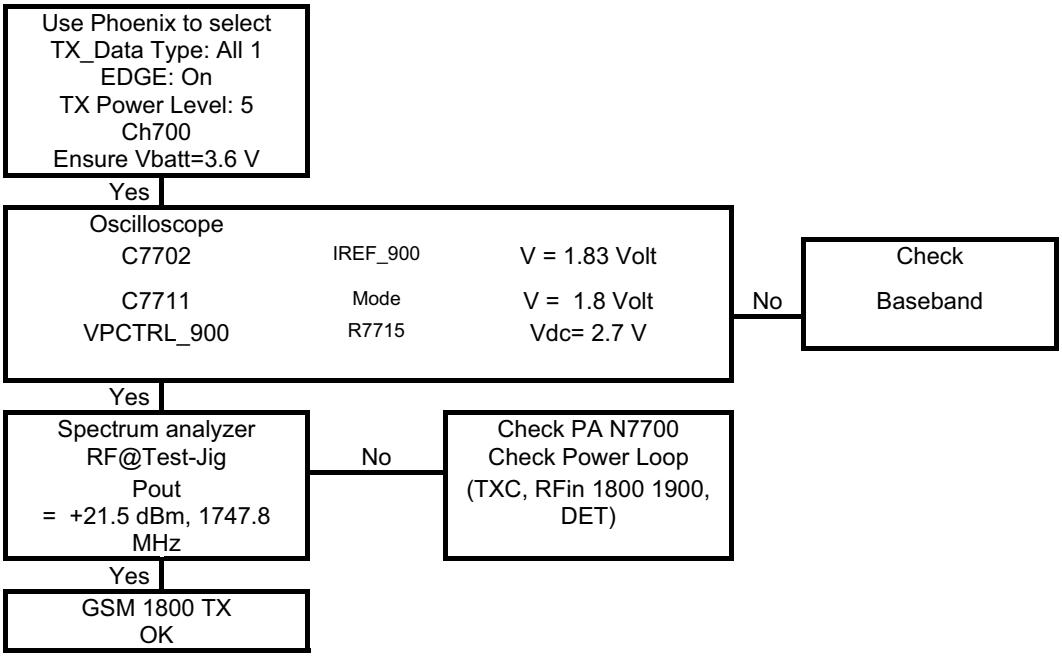
EDGE

Ensure that GMSK is ok.



GSM1900 transmitter

General instructions for GSM1900 TX troubleshooting

Start the preparations as described in chapter “General instructions for TX troubleshooting”.

GMSK

Set operating mode to local mode.

Select	Testing	RF Controls

Wait until the RF Controls window pops up.

Select	Band	GSM 1900
	Active unit	TX
	Operation mode	Burst
	RX/TX Channel	661
	TX Power Level	5
	TX Data Type	Random
	Edge	Off

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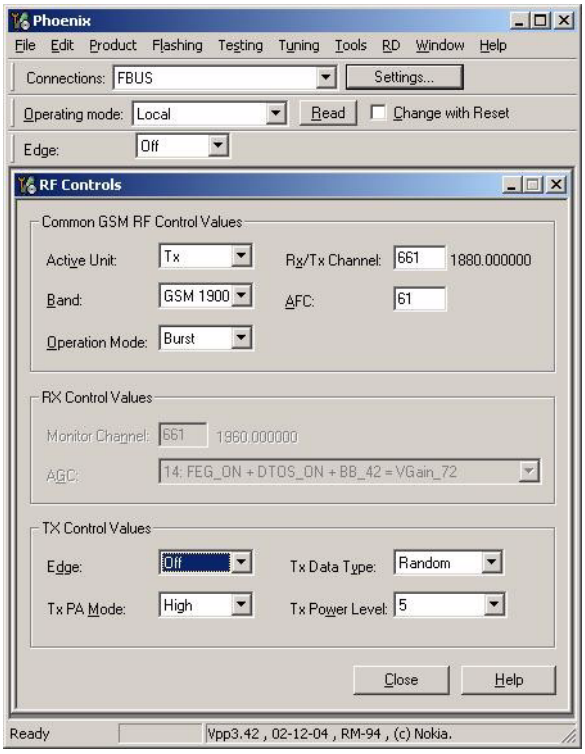
The setup should now look like this:



Now the measurement equipment should detect the following output signal of the phone:

P_{out} = +23dBm @ 1880 MHz

If this is not the case, then go to the GMSK fault finding chart for GSM1900 transmitter.

EDGE

Set operating mode to local mode.

Select	Testing	RF Controls

Wait until the RF Controls window pops up.

Select	Band	GSM 1900
	Active unit	TX
	Operation mode	Burst
	RX/TX Channel	661
	TX Power Level	5
	TX Data Type	All1
	Edge	On

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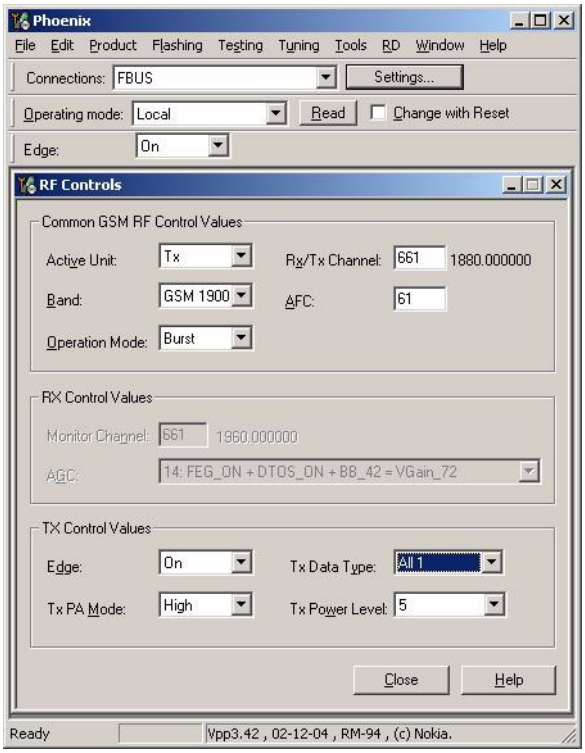
The setup should now look like this:



Now the measurement equipment should detect the following output signal of the phone:

P_{out} = +21.5 dBm @ 1880 MHz

If this is not the case, then go to the EDGE fault finding chart for GSM1900 transmitter.

Fault finding chart for GSM1900 transmitter

In the following, it is assumed that the TXP signal is used as trigger signal. For that, a TXP test point is provided.

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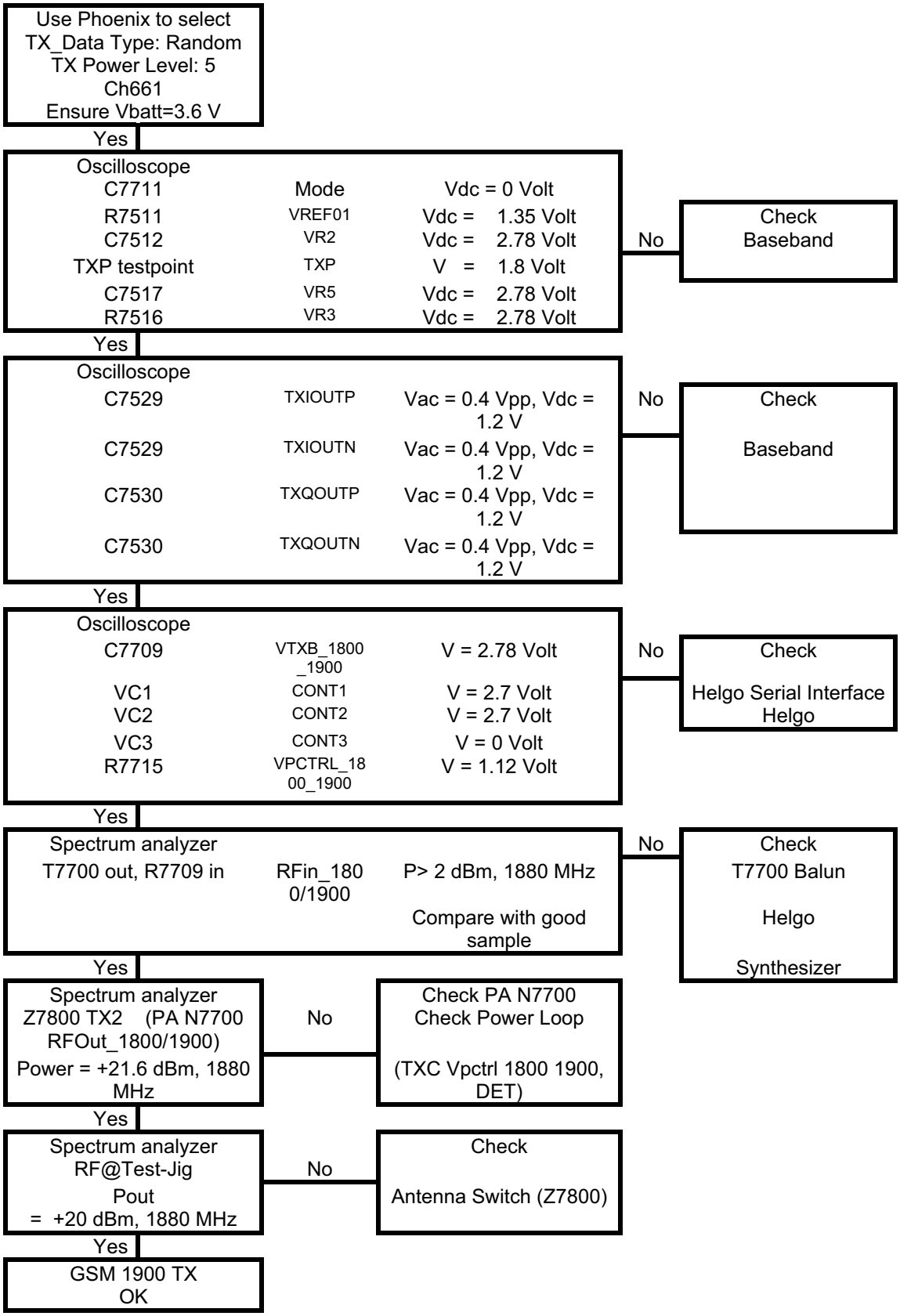
GMSK



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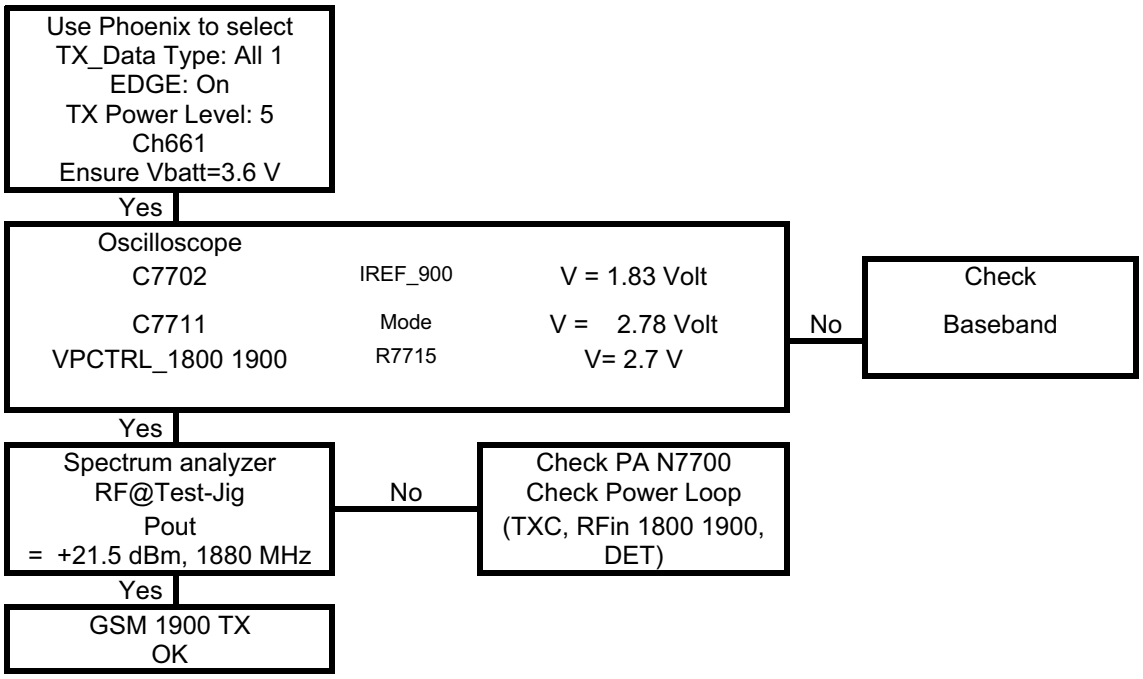
EDGE

Ensure that GMSK is ok.



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Synthesizer

General instructions for synthesizer troubleshooting

Connect the phone to a PC, which has Phoenix Service Software and a dongle installed, using either

- repair jig and DAU-9S (RS232) cable or
- repair jig and XCS-4 cable via FPS-8 Flash Box or
- DAU-9T cable (RS232).

Connect the phone to a power supply (DC voltage of 3.6V) and switch the phone on.

Follow the instructions in the chapters below.

Checking synthesizer operation

Start Phoenix Service Software and open FBUS connection.

Select “Scan Product” (Ctrl-R or in menu File - Scan Product).

Wait until phone information is shown in the lower right corner of the screen.

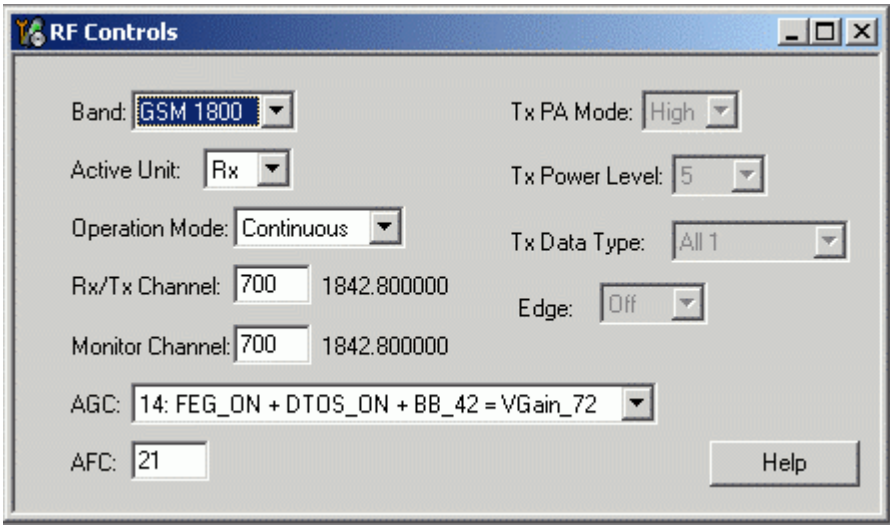
Set <operating mode> to <Local>.

Open window “RF Controls” (menu Testing - RF Controls)

Set the synthesizer to the following mode:

Select	Band	GSM 1800
	Active unit	RX
	Operation mode	Continuous
	RX/TX Channel	700

The setup should now look like this:



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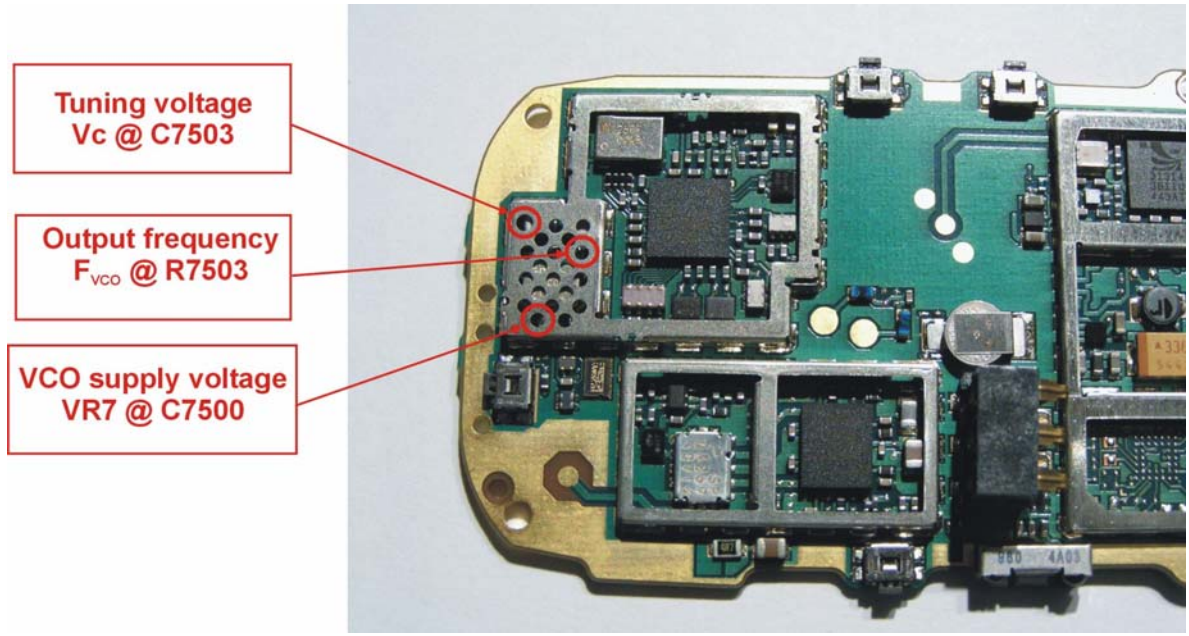
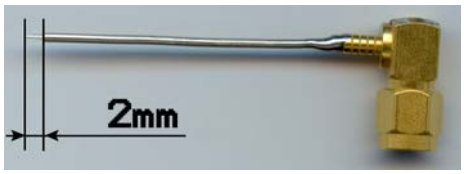
The VCO chamber has a fixed shielding lid, which can only be opened by destroying it. To enable measurements with a closed lid, holes are located at positions where the supply voltage VR7, the tuning voltage Vc and the output frequency f_{VCO} can be measured.

Figure 1:Test holes in the VCO chamber



The VCO frequency has to be measured with a special probe, which fits into the holes of the shielding lid. A thin coax cable can be used for this purpose, where the outer conductor is removed for 2mm. The isolation and the inner conductor must fit into the hole of the shielding lid and provide a capacitive coupling to the attenuator R7503 at the VCO output. A spectrum analyzer is used to display the frequency.

Figure 2:VCO probe



The VCO frequency is twice the Rx frequency in the GSM1800 band:

$f_{VCO} = 2 * f_{RX} = 2 * 1842.8$ MHz = **3685.6 MHz**

The tuning voltage can be easily measured at the Vc input of the VCO. The corresponding hole in the shielding lid enables the voltage measurement at C7503, which shows the same DC voltage as Vc.

The tuning voltage should be **$2.1V_{DC}$ .. $2.6V_{DC}$** at f_{VCO} = 3685.6MHz.

The tuning sensitivity of the VCO is typically 250MHz/V. The typical relation of VCO frequency and tuning voltage is shown in the following diagram:

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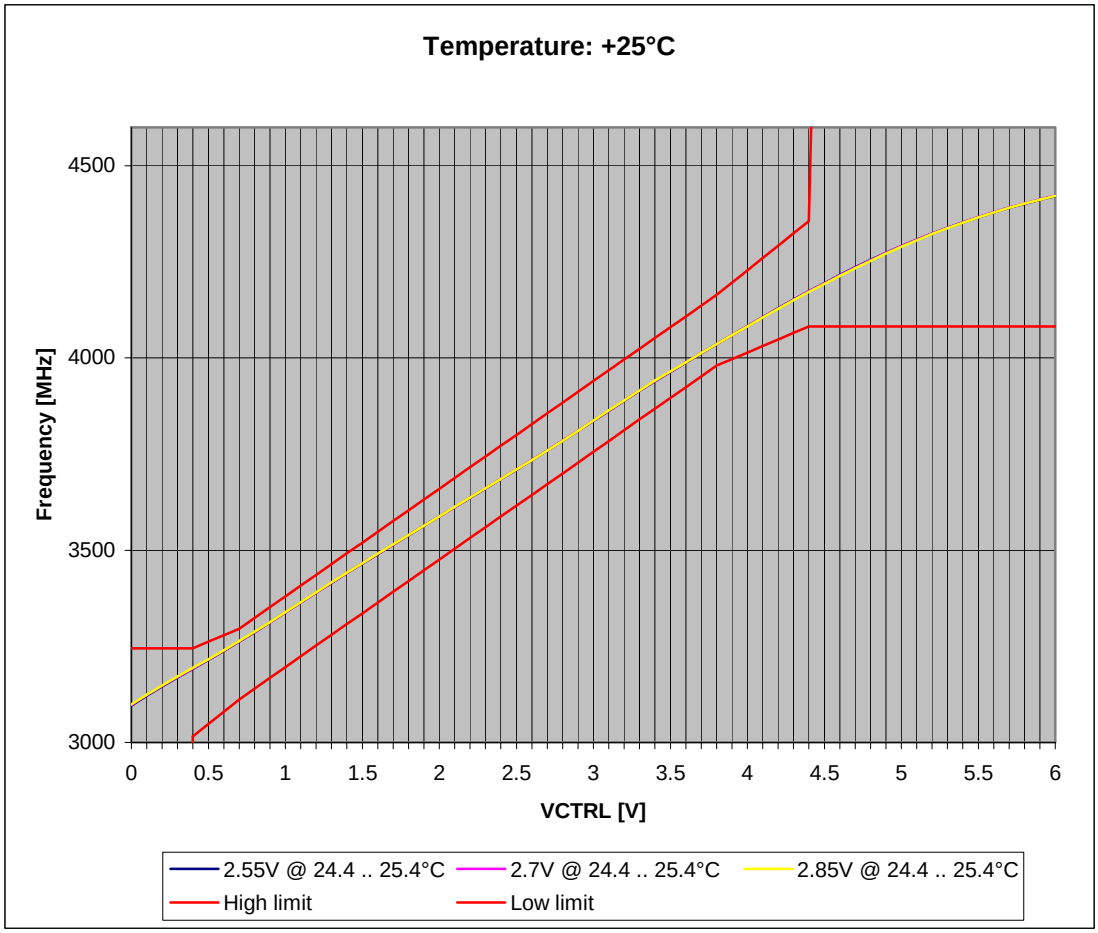
Figure 3:Typical frequency tuning curve for the FDK VCO



Even if the PLL is not working properly (Vc outside the valid range), a frequency at the output of the VCO can be detected between 3GHz and 4.4 GHz (if the VCO itself is ok and the supply voltage VR7 = 2.78V is applied).

If the frequency or the tuning voltage have other values than given above, see the fault finding chart for PLL syntesizer below.

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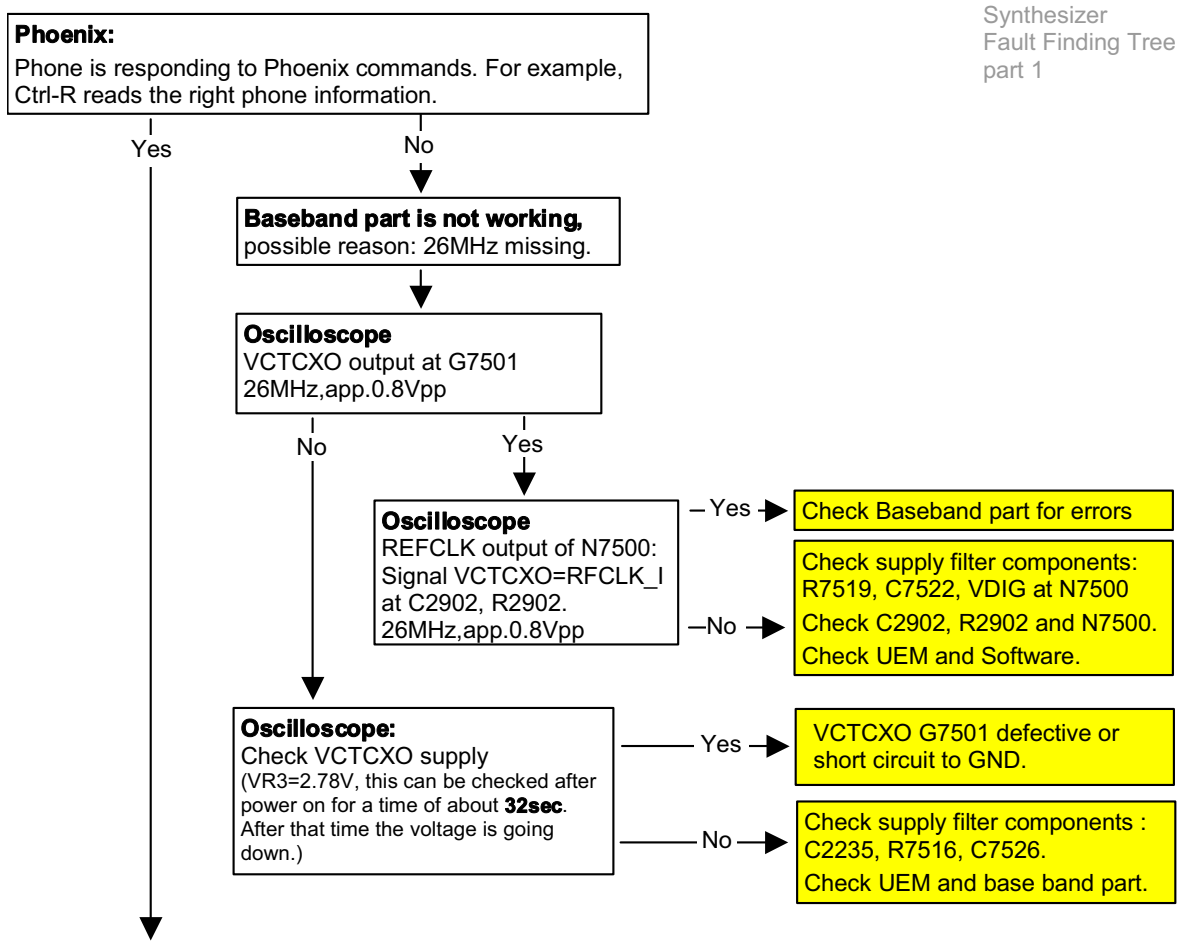
Fault finding chart for PLL synthesizer

Figure 4:PLL Fault Finding Tree



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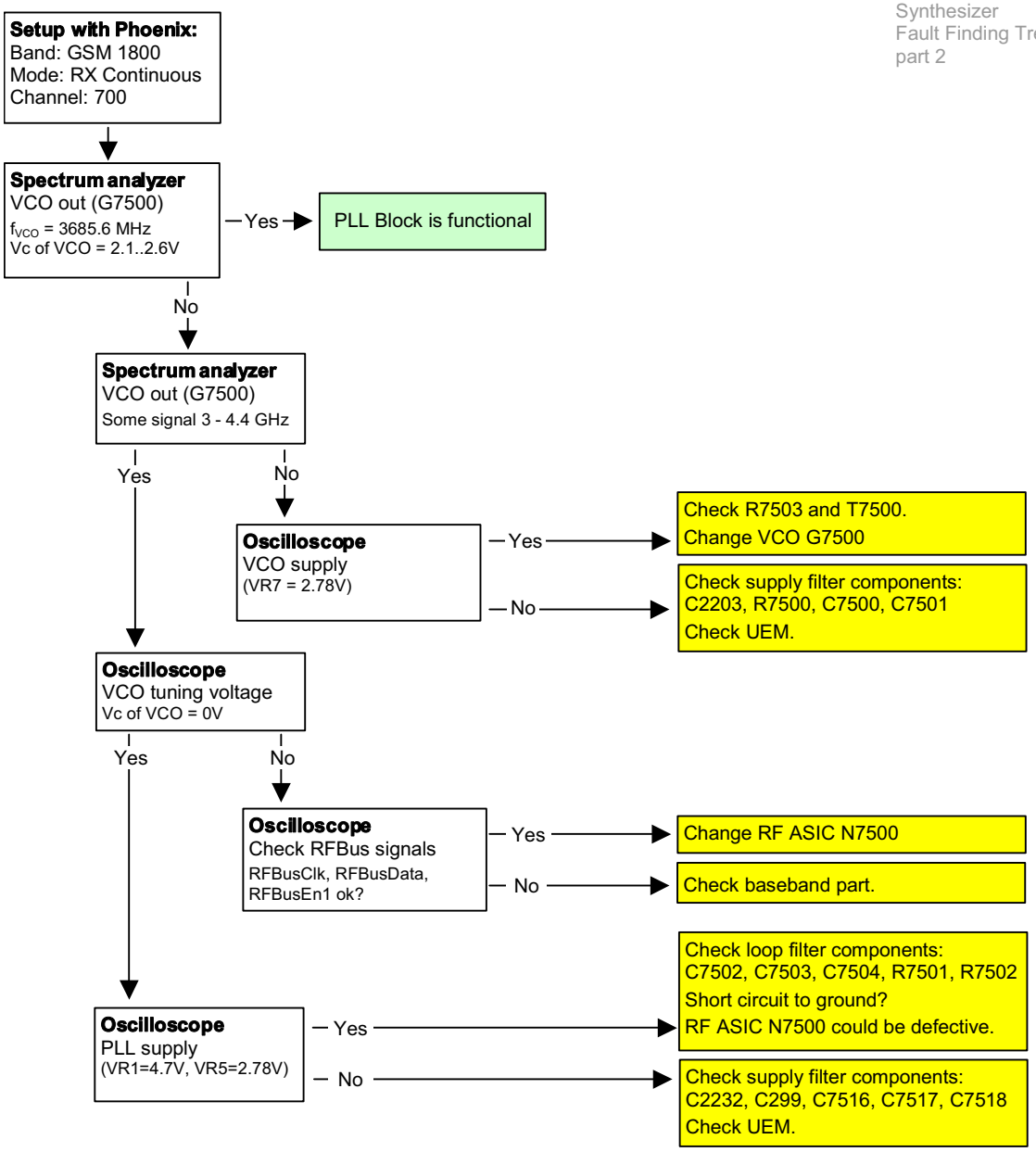
Synthesizer
Fault Finding Tree
part 2



It is important to note that the power supply VR3 of the VCTCXO is only switched off in the so called ‘Deep Sleep Mode’ and the power supply VR7 of the VCO (G7500) is switched off in so called ‘Sleep Mode’.

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Frequency tables

GSM900 (including EGSM900)

Frequency list EGSM900														
CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX
975	880.2	925.2	3520.8	3700.8	1	890.2	935.2	3560.8	3740.8	63	902.6	947.6	3610.4	3790.4
976	880.4	925.4	3521.6	3701.6	2	890.4	935.4	3561.6	3741.6	64	902.8	947.8	3611.2	3791.2
977	880.6	925.6	3522.4	3702.4	3	890.6	935.6	3562.4	3742.4	65	903.0	948.0	3612.0	3792.0
978	880.8	925.8	3523.2	3703.2	4	890.8	935.8	3563.2	3743.2	66	903.2	948.2	3612.8	3792.8
979	881.0	926.0	3524.0	3704.0	5	891.0	936.0	3564.0	3744.0	67	903.4	948.4	3613.6	3793.6
980	881.2	926.2	3524.8	3704.8	6	891.2	936.2	3564.8	3744.8	68	903.6	948.6	3614.4	3794.4
981	881.4	926.4	3525.6	3705.6	7	891.4	936.4	3565.6	3745.6	69	903.8	948.8	3615.2	3795.2
982	881.6	926.6	3526.4	3706.4	8	891.6	936.6	3566.4	3746.4	70	904.0	949.0	3616.0	3796.0
983	881.8	926.8	3527.2	3707.2	9	891.8	936.8	3567.2	3747.2	71	904.2	949.2	3616.8	3796.8
984	882.0	927.0	3528.0	3708.0	10	892.0	937.0	3568.0	3748.0	72	904.4	949.4	3617.6	3797.6
985	882.2	927.2	3528.8	3708.8	11	892.2	937.2	3568.8	3748.8	73	904.6	949.6	3618.4	3798.4
986	882.4	927.4	3529.6	3709.6	12	892.4	937.4	3569.6	3749.6	74	904.8	949.8	3619.2	3799.2
987	882.6	927.6	3530.4	3710.4	13	892.6	937.6	3570.4	3750.4	75	905.0	950.0	3620.0	3800.0
988	882.8	927.8	3531.2	3711.2	14	892.8	937.8	3571.2	3751.2	76	905.2	950.2	3620.8	3800.8
989	883.0	928.0	3532.0	3712.0	15	893.0	938.0	3572.0	3752.0	77	905.4	950.4	3621.6	3801.6
990	883.2	928.2	3532.8	3712.8	16	893.2	938.2	3572.8	3752.8	78	905.6	950.6	3622.4	3802.4
991	883.4	928.4	3533.6	3713.6	17	893.4	938.4	3573.6	3753.6	79	905.8	950.8	3623.2	3803.2
992	883.6	928.6	3534.4	3714.4	18	893.6	938.6	3574.4	3754.4	80	906.0	951.0	3624.0	3804.0
993	883.8	928.8	3535.2	3715.2	19	893.8	938.8	3575.2	3755.2	81	906.2	951.2	3624.8	3804.8
994	884.0	929.0	3536.0	3716.0	20	894.0	939.0	3576.0	3756.0	82	906.4	951.4	3625.6	3805.6
995	884.2	929.2	3536.8	3716.8	21	894.2	939.2	3576.8	3756.8	83	906.6	951.6	3626.4	3806.4
996	884.4	929.4	3537.6	3717.6	22	894.4	939.4	3577.6	3757.6	84	906.8	951.8	3627.2	3807.2
997	884.6	929.6	3538.4	3718.4	23	894.6	939.6	3578.4	3758.4	85	907.0	952.0	3628.0	3808.0
998	884.8	929.8	3539.2	3719.2	24	894.8	939.8	3579.2	3759.2	86	907.2	952.2	3628.8	3808.8
999	885.0	930.0	3540.0	3720.0	25	895.0	940.0	3580.0	3760.0	87	907.4	952.4	3629.6	3809.6
1000	885.2	930.2	3540.8	3720.8	26	895.2	940.2	3580.8	3760.8	88	907.6	952.6	3630.4	3810.4
1001	885.4	930.4	3541.6	3721.6	27	895.4	940.4	3581.6	3761.6	89	907.8	952.8	3631.2	3811.2
1002	885.6	930.6	3542.4	3722.4	28	895.6	940.6	3582.4	3762.4	90	908.0	953.0	3632.0	3812.0
1003	885.8	930.8	3543.2	3723.2	29	895.8	940.8	3583.2	3763.2	91	908.2	953.2	3632.8	3812.8
1004	886.0	931.0	3544.0	3724.0	30	896.0	941.0	3584.0	3764.0	92	908.4	953.4	3633.6	3813.6
1005	886.2	931.2	3544.8	3724.8	31	896.2	941.2	3584.8	3764.8	93	908.6	953.6	3634.4	3814.4
1006	886.4	931.4	3545.6	3725.6	32	896.4	941.4	3585.6	3765.6	94	908.8	953.8	3635.2	3815.2
1007	886.6	931.6	3546.4	3726.4	33	896.6	941.6	3586.4	3766.4	95	909.0	954.0	3636.0	3816.0
1008	886.8	931.8	3547.2	3727.2	34	896.8	941.8	3587.2	3767.2	96	909.2	954.2	3636.8	3816.8
1009	887.0	932.0	3548.0	3728.0	35	897.0	942.0	3588.0	3768.0	97	909.4	954.4	3637.6	3817.6
1010	887.2	932.2	3548.8	3728.8	36	897.2	942.2	3588.8	3768.8	98	909.6	954.6	3638.4	3818.4
1011	887.4	932.4	3549.6	3729.6	37	897.4	942.4	3589.6	3769.6	99	909.8	954.8	3639.2	3819.2
1012	887.6	932.6	3550.4	3730.4	38	897.6	942.6	3590.4	3770.4	100	910.0	955.0	3640.0	3820.0
1013	887.8	932.8	3551.2	3731.2	39	897.8	942.8	3591.2	3771.2	101	910.2	955.2	3640.8	3820.8
1014	888.0	933.0	3552.0	3732.0	40	898.0	943.0	3592.0	3772.0	102	910.4	955.4	3641.6	3821.6
1015	888.2	933.2	3552.8	3732.8	41	898.2	943.2	3592.8	3772.8	103	910.6	955.6	3642.4	3822.4
1016	888.4	933.4	3553.6	3733.6	42	898.4	943.4	3593.6	3773.6	104	910.8	955.8	3643.2	3823.2
1017	888.6	933.6	3554.4	3734.4	43	898.6	943.6	3594.4	3774.4	105	911.0	956.0	3644.0	3824.0
1018	888.8	933.8	3555.2	3735.2	44	898.8	943.8	3595.2	3775.2	106	911.2	956.2	3644.8	3824.8
1019	889.0	934.0	3556.0	3736.0	45	899.0	944.0	3596.0	3776.0	107	911.4	956.4	3645.6	3825.6
1020	889.2	934.2	3556.8	3736.8	46	899.2	944.2	3596.8	3776.8	108	911.6	956.6	3646.4	3826.4
1021	889.4	934.4	3557.6	3737.6	47	899.4	944.4	3597.6	3777.6	109	911.8	956.8	3647.2	3827.2
1022	889.6	934.6	3558.4	3738.4	48	899.6	944.6	3598.4	3778.4	110	912.0	957.0	3648.0	3828.0
1023	889.8	934.8	3559.2	3739.2	49	899.8	944.8	3599.2	3779.2	111	912.2	957.2	3648.8	3828.8
0	890.0	935.0	3560.0	3740.0	50	900.0	945.0	3600.0	3780.0	112	912.4	957.4	3649.6	3829.6
					51	900.2	945.2	3600.8	3780.8	113	912.6	957.6	3650.4	3830.4
					52	900.4	945.4	3601.6	3781.6	114	912.8	957.8	3651.2	3831.2
					53	900.6	945.6	3602.4	3782.4	115	913.0	958.0	3652.0	3832.0
					54	900.8	945.8	3603.2	3783.2	116	913.2	958.2	3652.8	3832.8
					55	901.0	946.0	3604.0	3784.0	117	913.4	958.4	3653.6	3833.6
					56	901.2	946.2	3604.8	3784.8	118	913.6	958.6	3654.4	3834.4
					57	901.4	946.4	3605.6	3785.6	119	913.8	958.8	3655.2	3835.2
					58	901.6	946.6	3606.4	3786.4	120	914.0	959.0	3656.0	3836.0
					59	901.8	946.8	3607.2	3787.2	121	914.2	959.2	3656.8	3836.8
					60	902.0	947.0	3608.0	3788.0	122	914.4	959.4	3657.6	3837.6
					61	902.2	947.2	3608.8	3788.8	123	914.6	959.6	3658.4	3838.4
					62	902.4	947.4	3609.6	3789.6	124	914.8	959.8	3659.2	3839.2

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GSM1800

Ch	TX	RX	VCO TX	VCO RX
547	1717.2	1812.2	3434.4	3624.4
548	1717.4	1812.4	3434.8	3624.8
549	1717.6	1812.6	3435.2	3625.2
550	1717.8	1812.8	3435.6	3625.6
551	1718.0	1813.0	3436.0	3626.0
552	1718.2	1813.2	3436.4	3626.4
553	1718.4	1813.4	3436.8	3626.8
554	1718.6	1813.6	3437.2	3627.2
555	1718.8	1813.8	3437.6	3627.6
556	1719.0	1814.0	3438.0	3628.0
557	1719.2	1814.2	3438.4	3628.4
558	1719.4	1814.4	3438.8	3628.8
559	1719.6	1814.6	3439.2	3629.2
560	1719.8	1814.8	3439.6	3629.6
561	1720.0	1815.0	3440.0	3630.0
562	1720.2	1815.2	3440.4	3630.4
563	1720.4	1815.4	3440.8	3630.8
564	1720.6	1815.6	3441.2	3631.2
565	1720.8	1815.8	3441.6	3631.6
566	1721.0	1816.0	3442.0	3632.0
567	1721.2	1816.2	3442.4	3632.4
568	1721.4	1816.4	3442.8	3632.8
569	1721.6	1816.6	3443.2	3633.2
570	1721.8	1816.8	3443.6	3633.6
571	1722.0	1817.0	3444.0	3634.0
572	1722.2	1817.2	3444.4	3634.4
573	1722.4	1817.4	3444.8	3634.8
574	1722.6	1817.6	3445.2	3635.2
575	1722.8	1817.8	3445.6	3635.6
576	1723.0	1818.0	3446.0	3636.0
577	1723.2	1818.2	3446.4	3636.4
578	1723.4	1818.4	3446.8	3636.8
579	1723.6	1818.6	3447.2	3637.2
580	1723.8	1818.8	3447.6	3637.6
581	1724.0	1819.0	3448.0	3638.0
582	1724.2	1819.2	3448.4	3638.4
583	1724.4	1819.4	3448.8	3638.8
584	1724.6	1819.6	3449.2	3639.2
585	1724.8	1819.8	3449.6	3639.6
586	1725.0	1820.0	3450.0	3640.0
587	1725.2	1820.2	3450.4	3640.4
588	1725.4	1820.4	3450.8	3640.8
589	1725.6	1820.6	3451.2	3641.2
590	1725.8	1820.8	3451.6	3641.6
591	1726.0	1821.0	3452.0	3642.0
592	1726.2	1821.2	3452.4	3642.4
593	1726.4	1821.4	3452.8	3642.8
594	1726.6	1821.6	3453.2	3643.2
595	1726.8	1821.8	3453.6	3643.6
596	1727.0	1822.0	3454.0	3644.0
597	1727.2	1822.2	3454.4	3644.4
598	1727.4	1822.4	3454.8	3644.8
599	1727.6	1822.6	3455.2	3645.2
600	1727.8	1822.8	3455.6	3645.6
601	1728.0	1823.0	3456.0	3646.0
602	1728.2	1823.2	3456.4	3646.4
603	1728.4	1823.4	3456.8	3646.8
604	1728.6	1823.6	3457.2	3647.2
605	1728.8	1823.8	3457.6	3647.6
606	1729.0	1824.0	3458.0	3648.0
607	1729.2	1824.2	3458.4	3648.4
608	1729.4	1824.4	3458.8	3648.8
609	1729.6	1824.6	3459.2	3649.2
610	1729.8	1824.8	3459.6	3649.6
611	1730.0	1825.0	3460.0	3650.0
612	1730.2	1825.2	3460.4	3650.4
613	1730.4	1825.4	3460.8	3650.8
614	1730.6	1825.6	3461.2	3651.2
615	1730.8	1825.8	3461.6	3651.6
616	1731.0	1826.0	3462.0	3652.0
617	1731.2	1826.2	3462.4	3652.4
618	1731.4	1826.4	3462.8	3652.8
619	1731.6	1826.6	3463.2	3653.2
620	1731.8	1826.8	3463.6	3653.6
621	1732.0	1827.0	3464.0	3654.0
622	1732.2	1827.2	3464.4	3654.4
623	1732.4	1827.4	3464.8	3654.8
624	1732.6	1827.6	3465.2	3655.2
625	1732.8	1827.8	3465.6	3655.6
626	1733.0	1828.0	3466.0	3656.0
627	1733.2	1828.2	3466.4	3656.4
628	1733.4	1828.4	3466.8	3656.8
629	1733.6	1828.6	3467.2	3657.2
630	1733.8	1828.8	3467.6	3657.6
631	1734.0	1829.0	3468.0	3658.0
632	1734.2	1829.2	3468.4	3658.4
633	1734.4	1829.4	3468.8	3658.8
634	1734.6	1829.6	3469.2	3659.2
635	1734.8	1829.8	3469.6	3659.6
636	1735.0	1830.0	3470.0	3660.0
637	1735.2	1830.2	3470.4	3660.4
638	1735.4	1830.4	3470.8	3660.8
639	1735.6	1830.6	3471.2	3661.2
640	1735.8	1830.8	3471.6	3661.6
641	1736.0	1831.0	3472.0	3662.0
642	1736.2	1831.2	3472.4	3662.4
643	1736.4	1831.4	3472.8	3662.8
644	1736.6	1831.6	3473.2	3663.2
645	1736.8	1831.8	3473.6	3663.6
646	1737.0	1832.0	3474.0	3664.0
647	1737.2	1832.2	3474.4	3664.4
648	1737.4	1832.4	3474.8	3664.8
649	1737.6	1832.6	3475.2	3665.2
650	1737.8	1832.8	3475.6	3665.6
651	1738.0	1833.0	3476.0	3666.0
652	1738.2	1833.2	3476.4	3666.4
653	1738.4	1833.4	3476.8	3666.8
654	1738.6	1833.6	3477.2	3667.2
655	1738.8	1833.8	3477.6	3667.6
656	1739.0	1834.0	3478.0	3668.0
657	1739.2	1834.2	3478.4	3668.4
658	1739.4	1834.4	3478.8	3668.8
659	1739.6	1834.6	3479.2	3669.2
660	1739.8	1834.8	3479.6	3669.6
661	1740.0	1835.0	3480.0	3670.0
662	1740.2	1835.2	3480.4	3670.4
663	1740.4	1835.4	3480.8	3670.8
664	1740.6	1835.6	3481.2	3671.2
665	1740.8	1835.8	3481.6	3671.6
666	1741.0	1836.0	3482.0	3672.0
667	1741.2	1836.2	3482.4	3672.4
668	1741.4	1836.4	3482.8	3672.8
669	1741.6	1836.6	3483.2	3673.2
670	1741.8	1836.8	3483.6	3673.6
671	1742.0	1837.0	3484.0	3674.0
672	1742.2	1837.2	3484.4	3674.4
673	1742.4	1837.4	3484.8	3674.8
674	1742.6	1837.6	3485.2	3675.2
675	1742.8	1837.8	3485.6	3675.6
676	1743.0	1838.0	3486.0	3676.0
677	1743.2	1838.2	3486.4	3676.4
678	1743.4	1838.4	3486.8	3676.8
679	1743.6	1838.6	3487.2	3677.2
680	1743.8	1838.8	3487.6	3677.6
681	1744.0	1839.0	3488.0	3678.0
682	1744.2	1839.2	3488.4	3678.4
683	1744.4	1839.4	3488.8	3678.8
684	1744.6	1839.6	3489.2	3679.2
685	1744.8	1839.8	3489.6	3679.6
686	1745.0	1840.0	3490.0	3680.0
687	1745.2	1840.2	3490.4	3680.4
688	1745.4	1840.4	3490.8	3680.8
689	1745.6	1840.6	3491.2	3681.2
690	1745.8	1840.8	3491.6	3681.6
691	1746.0	1841.0	3492.0	3682.0
692	1746.2	1841.2	3492.4	3682.4
693	1746.4	1841.4	3492.8	3682.8
694	1746.6	1841.6	3493.2	3683.2
695	1746.8	1841.8	3493.6	3683.6
696	1747.0	1842.0	3494.0	3684.0
697	1747.2	1842.2	3494.4	3684.4
698	1747.4	1842.4	3494.8	3684.8
699	1747.6	1842.6	3495.2	3685.2
700	1747.8	1842.8	3495.6	3685.6
701	1748.0	1843.0	3496.0	3686.0
702	1748.2	1843.2	3496.4	3686.4
703	1748.4	1843.4	3496.8	3686.8
704	1748.6	1843.6	3497.2	3687.2
705	1748.8	1843.8	3497.6	3687.6
706	1749.0	1844.0	3498.0	3688.0
707	1749.2	1844.2	3498.4	3688.4
708	1749.4	1844.4	3498.8	3688.8
709	1749.6	1844.6	3499.2	3689.2
710	1749.8	1844.8	3499.6	3689.6
711	1750.0	1845.0	3500.0	3690.0
712	1750.2	1845.2	3500.4	3690.4
713	1750.4	1845.4	3500.8	3690.8
714	1750.6	1845.6	3501.2	3691.2
715	1750.8	1845.8	3501.6	3691.6
716	1751.0	1846.0	3502.0	3692.0
717	1751.2	1846.2	3502.4	3692.4
718	1751.4	1846.4	3502.8	3692.8
719	1751.6	1846.6	3503.2	3693.2
720	1751.8	1846.8	3503.6	3693.6
721	1752.0	1847.0	3504.0	3694.0
722	1752.2	1847.2	3504.4	3694.4
723	1752.4	1847.4	3504.8	3694.8
724	1752.6	1847.6	3505.2	3695.2
725	1752.8	1847.8	3505.6	3695.6
726	1753.0	1848.0	3506.0	3696.0
727	1753.2	1848.2	3506.4	3696.4
728	1753.4	1848.4	3506.8	3696.8
729	1753.6	1848.6	3507.2	3697.2
730	1753.8	1848.8	3507.6	3697.6
731	1754.0	1849.0	3508.0	3698.0
732	1754.2	1849.2	3508.4	3698.4
733	1754.4	1849.4	3508.8	3698.8
734	1754.6	1849.6	3509.2	3699.2
735	1754.8	1849.8	3509.6	3699.6
736	1755.0	1850.0	3510.0	3700.0
737	1755.2	1850.2	3510.4	3700.4
738	1755.4	1850.4	3510.8	3700.8
739	1755.6	1850.6	3511.2	3701.2
740	1755.8	1850.8	3511.6	3701.6
741	1756.0	1851.0	3512.0	3702.0
742	1756.2	1851.2	3512.4	3702.4
743	1756.4	1851.4	3512.8	3702.8
744	1756.6	1851.6	3513.2	3703.2
745	1756.8	1851.8	3513.6	3703.6
746	1757.0	1852.0	3514.0	3704.0
747	1757.2	1852.2	3514.4	3704.4
748	1757.4	1852.4	3514.8	3704.8
749	1757.6	1852.6	3515.2	3705.2
750	1757.8	1852.8	3515.6	3705.6
751	1758.0	1853.0	3516.0	3706.0
752	1758.2	1853.2	3516.4	3706.4
753	1758.4	1853.4	3516.8	3706.8
754	1758.6	1853.6	3517.2	3707.2
755	1758.8	1853.8	3517.6	3707.6
756	1759.0	1854.0	3518.0	3708.0
757	1759.2	1854.2	3518.4	3708.4
758	1759.4	1854.4	3518.8	3708.8
759	1759.6	1854.6	3519.2	3709.2
760	1759.8	1854.8	3519.6	3709.6
761	1760.0	1855.0	3520.0	3710.0
762	1760.2	1855.2	3520.4	3710.4
763	1760.4	1855.4	3520.8	3710.8
764	1760.6	1855.6	3521.2	3711.2
765	1760.8	1855.8	3521.6	3711.6
766	1761.0	1856.0	3522.0	3712.0
767	1761.2	1856.2	3522.4	3712.4
768	1761.4	1856.4	3522.8	3712.8
769	1761.6	1856.6	3523.2	3713.2
770	1761.8	1856.8	3523.6	3713.6
771	1762.0	1857.0	3524.0	3714.0
772	1762.2	1857.2	3524.4	3714.4
773	1762.4	1857.4	3524.8	3714.8
774	1762.6	1857.6	3525.2	3715.2
775	1762.8	1857.8	3525.6	3715.6
776	1763.0	1858.0	3526.0	3716.0
777	1763.2	1858.2	3526.4	3716.4
778	1763.4	1858.4	3526.8	3716.8
779	1763.6	1858.6	3527.2	3717.2
780	1763.8	1858.8	3527.6	3717.6
781	1764.0	1859.0	3528.0	3718.0
782	1764.2	1859.2	3528.4	3718.4
783	1764.4	1859.4	3528.8	3718.8
784	1764.6	1859.6	3529.2	3719.2
785	1764.8	1859.8	3529.6	3719.6
786	1765.0	1860.0	3530.0	3720.0
787	1765.2	1860.2	3530.4	3720.4
788	1765.4	1860.4	3530.8	3720.8
789	1765.6	1860.6	3531.2	3721.2
790	1765.8	1860.8	3531.6	3721.6
791	1766.0	1861.0	3532.0	3722.0
792	1766.2	1861.2	3532.4	3722.4
793	1766.4	1861.4	3532.8	3722.8
794	1766.6	1861.6	3533.2	3723.2
795	1766.8	1861.8	3533.6	3723.6
796	1767.0	1862.0	3534.0	3724.0
797	1767.2	1862.2	3534.4	3724.4
798	1767.4	1862.4	3534.8	3724.8
799	1767.6	1862.6	3535.2	3725.2
800	1767.8	1862.8	3535.6	3725.6
801	1768.0	1863.0	3536.0	3726.0
802	1768.2	1863.2	3536.4	3726.4
803	1768.4	1863.4	3536.8	3726.8
804	1768.6	1863.6	3537.2	3727.2
805	1768.8	1863.8	3537.6	3727.6
806	1769.0	1864.0	3538.0	3728.0
807	1769.2	1864.2	3538.4	3728.4
808	1769.4	1864.4	3538.8	3728.8
809	1769.6	1864.6	3539.2	3729.2
810	1769.8	1864.8	3539.6	3729.6
811	1770.0	1865.0	3540.0	3730.0
812	1770.2	1865.2	3540.4	3730.4
813	1770.4	1865.4	3540.8	3730.8
814	1770.6	1865.6	3541.2	3731.2
815	1770.8	1865.8	3541.6	3731.6
816	1771.0	1866.0	3542.0	3732.0
817	1771.2	1866.2	3542.4	3732.4
818	1771.4	1866.4	3542.8	3732.8
819	1771.6	1866.6	3543.2	3733.2
820	1771.8	1866.8	3543.6	3733.6
821	1772.0	1867.0	3544.0	3734.0
822	1772.2	1867.2	3544.4	3734.4
823	1772.4	1867.4	3544.8	3734.8
824	1772.6	1867.6	3545.2	3735.2
825	1772.8	1867.8	3545.6	3735.6
826	1773.0	1868.0	3546.0	3736.0
827	1773.2	1868.2	3546.4	3736.4
828	1773.4	1868.4	3546.8	3736.8
829	1773.6	1868.6	3547.2	3737.2
830	1773.8	1868.8	3547.6	3737.6
831	1774.0	1869.0	3548.0	3738.0
832	1774.2	1869.2	3548.4	3738.4
833	1774.4	1869.4	3548.8	3738.8
834	1774.6	1869.6	3549.2	3739.2
835	1774.8	1869.8	3549.6	3739.6
836	1775.0	1870.0	3550.0	3740.0
837	1775.2	1870.2	3550.4	3740.4
838	1775.4	1870.4	3550.8	3740.8
839	1775.6	1870.6	3551.2	3741.2
840	1775.8	1870.8	3551.6	3741.6
841	1776.0	1871.0	3552.0	3742.0
842	1776.2	1871.2	3552.4	3742.4
843	1776.4	1871.4	3552.8	3742.8
844	1776.6	1871.6	3553.2	3743.2
845	1776.8	1871.8	3553.6	3743.6
846	1777.0	1872.0	3554.0	3744.0
847	1777.2	1872.2	3554.4	3744.4
848	1777.4	1872.4	3554.8	3744.8
849	1777.6	1872.6	3555.2	3745.2
850	1777.8	1872.8	3555.6	3745.6
851	1778.0	1873.0	3556.0	3746.0
852	1778.2	1873.2	3556.4	3746.4
853	1778.4	1873.4	3556.8	3746.8
854	1778.6	1873.6	3557.2	3747.2
855	1778.8	1873.8	3557.6	3747.6
856	1779.0	1874.0	3558.0	3748.0
857	1779.2	1874.2	3558.4	3748.4
858	1779.4	1874.4	3558.8	3748.8
859	1779.6	1874.6	3559.2	3749.2
860	1779.8	1874.8	3559.6	3749.6
861	1780.0	1875.0	3560.0	3750.0
862	1780.2	1875.2	3560.4	3750.4
863	1780.4	1875.4	3560.8	3750.8
864	1780.6	1875.6	3561.2	3751.2
865	1780.8	1875.8	3561.6	3751.6
866	1781.0	1876.0	3562.0	3752.0
867	1781.2	1876.2	3562.4	3752.4
868	1781.4	1876.4	3562.8	3752.8
869	1781.6	1876.6	3563.2	3753.2
870	1781.8	1876.8	3563.6	3753.6
871	1782.0	1877.0	3564.0	3754.0
872	1782.2	1877.2	3564.4	3754.4
873	1782.4	1877.4	3564.8	3754.8
874	1782.6	1877.6	3565.2	3755.2
875	1782.8	1877.8	3565.6	3755.6
876	1783.0	1878.0	3566.0	3756.0
877	1783.2	1878.2	3566.4	3756.4
878	1783.4	1878.4	3566.8	3756.8
879	1783.6	1878.6	3567.2	3757.2
880	1783.8	1878.8	3567.6	3757.6
881	1784.0	1879.0	3568.0	3758.0
882	1784.2	1879.2	3568.4	3758.4
883	1784.4	1879.4	3568.8	3758.8
884	1784.6	1879.6	3569.2	3759.2
885	1784.8	1879.8	3569.6	3759.6

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GSM1900

CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX
512	1850,2	1930,2	3700,4	3860,4	606	1869,0	1949,0	3738,0	3898,0	700	1887,8	1967,8	3775,6	3935,6	794	1906,6	1986,6	3813,2	3973,2
513	1850,4	1930,4	3700,8	3860,8	607	1869,2	1949,2	3738,4	3898,4	701	1888,0	1968,0	3776,0	3936,0	795	1906,8	1986,8	3813,6	3973,6
514	1850,6	1930,6	3701,2	3861,2	608	1869,4	1949,4	3738,8	3898,8	702	1888,2	1968,2	3776,4	3936,4	796	1907,0	1987,0	3814,0	3974,0
515	1850,8	1930,8	3701,6	3861,6	609	1869,6	1949,6	3739,2	3899,2	703	1888,4	1968,4	3776,8	3936,8	797	1907,2	1987,2	3814,4	3974,4
516	1851,0	1931,0	3702,0	3862,0	610	1869,8	1949,8	3739,6	3899,6	704	1888,6	1968,6	3777,2	3937,2	798	1907,4	1987,4	3814,8	3974,8
517	1851,2	1931,2	3702,4	3862,4	611	1870,0	1950,0	3740,0	3900,0	705	1888,8	1968,8	3777,6	3937,6	799	1907,6	1987,6	3815,2	3975,2
518	1851,4	1931,4	3702,8	3862,8	612	1870,2	1950,2	3740,4	3900,4	706	1889,0	1969,0	3778,0	3938,0	800	1907,8	1987,8	3815,6	3975,6
519	1851,6	1931,6	3703,2	3863,2	613	1870,4	1950,4	3740,8	3900,8	707	1889,2	1969,2	3778,4	3938,4	801	1908,0	1988,0	3816,0	3976,0
520	1851,8	1931,8	3703,6	3863,6	614	1870,6	1950,6	3741,2	3901,2	708	1889,4	1969,4	3778,8	3938,8	802	1908,2	1988,2	3816,4	3976,4
521	1852,0	1932,0	3704,0	3864,0	615	1870,8	1950,8	3741,6	3901,6	709	1889,6	1969,6	3779,2	3939,2	803	1908,4	1988,4	3816,8	3976,8
522	1852,2	1932,2	3704,4	3864,4	616	1871,0	1951,0	3742,0	3902,0	710	1889,8	1969,8	3779,6	3939,6	804	1908,6	1988,6	3817,2	3977,2
523	1852,4	1932,4	3704,8	3864,8	617	1871,2	1951,2	3742,4	3902,4	711	1890,0	1970,0	3780,0	3940,0	805	1908,8	1988,8	3817,6	3977,6
524	1852,6	1932,6	3705,2	3865,2	618	1871,4	1951,4	3742,8	3902,8	712	1890,2	1970,2	3780,4	3940,4	806	1909,0	1989,0	3818,0	3978,0
525	1852,8	1932,8	3705,6	3865,6	619	1871,6	1951,6	3743,2	3903,2	713	1890,4	1970,4	3780,8	3940,8	807	1909,2	1989,2	3818,4	3978,4
526	1853,0	1933,0	3706,0	3866,0	620	1871,8	1951,8	3743,6	3903,6	714	1890,6	1970,6	3781,2	3941,2	808	1909,4	1989,4	3818,8	3978,8
527	1853,2	1933,2	3706,4	3866,4	621	1872,0	1952,0	3744,0	3904,0	715	1890,8	1970,8	3781,6	3941,6	809	1909,6	1989,6	3819,2	3979,2
528	1853,4	1933,4	3706,8	3866,8	622	1872,2	1952,2	3744,4	3904,4	716	1891,0	1971,0	3782,0	3942,0	810	1909,8	1989,8	3819,6	3979,6
529	1853,6	1933,6	3707,2	3867,2	623	1872,4	1952,4	3744,8	3904,8	717	1891,2	1971,2	3782,4	3942,4					
530	1853,8	1933,8	3707,6	3867,6	624	1872,6	1952,6	3745,2	3905,2	718	1891,4	1971,4	3782,8	3942,8					
531	1854,0	1934,0	3708,0	3868,0	625	1872,8	1952,8	3745,6	3905,6	719	1891,6	1971,6	3783,2	3943,2					
532	1854,2	1934,2	3708,4	3868,4	626	1873,0	1953,0	3746,0	3906,0	720	1891,8	1971,8	3783,6	3943,6					
533	1854,4	1934,4	3708,8	3868,8	627	1873,2	1953,2	3746,4	3906,4	721	1892,0	1972,0	3784,0	3944,0					
534	1854,6	1934,6	3709,2	3869,2	628	1873,4	1953,4	3746,8	3906,8	722	1892,2	1972,2	3784,4	3944,4					
535	1854,8	1934,8	3709,6	3869,6	629	1873,6	1953,6	3747,2	3907,2	723	1892,4	1972,4	3784,8	3944,8					
536	1855,0	1935,0	3710,0	3870,0	630	1873,8	1953,8	3747,6	3907,6	724	1892,6	1972,6	3785,2	3945,2					
537	1855,2	1935,2	3710,4	3870,4	631	1874,0	1954,0	3748,0	3908,0	725	1892,8	1972,8	3785,6	3945,6					
538	1855,4	1935,4	3710,8	3870,8	632	1874,2	1954,2	3748,4	3908,4	726	1893,0	1973,0	3786,0	3946,0					
539	1855,6	1935,6	3711,2	3871,2	633	1874,4	1954,4	3748,8	3908,8	727	1893,2	1973,2	3786,4	3946,4					
540	1855,8	1935,8	3711,6	3871,6	634	1874,6	1954,6	3749,2	3909,2	728	1893,4	1973,4	3786,8	3946,8					
541	1856,0	1936,0	3712,0	3872,0	635	1874,8	1954,8	3749,6	3909,6	729	1893,6	1973,6	3787,2	3947,2					
542	1856,2	1936,2	3712,4	3872,4	636	1875,0	1955,0	3750,0	3910,0	730	1893,8	1973,8	3787,6	3947,6					
543	1856,4	1936,4	3712,8	3872,8	637	1875,2	1955,2	3750,4	3910,4	731	1894,0	1974,0	3788,0	3948,0					
544	1856,6	1936,6	3713,2	3873,2	638	1875,4	1955,4	3750,8	3910,8	732	1894,2	1974,2	3788,4	3948,4					
545	1856,8	1936,8	3713,6	3873,6	639	1875,6	1955,6	3751,2	3911,2	733	1894,4	1974,4	3788,8	3948,8					
546	1857,0	1937,0	3714,0	3874,0	640	1875,8	1955,8	3751,6	3911,6	734	1894,6	1974,6	3789,2	3949,2					
547	1857,2	1937,2	3714,4	3874,4	641	1876,0	1956,0	3752,0	3912,0	735	1894,8	1974,8	3789,6	3949,6					
548	1857,4	1937,4	3714,8	3874,8	642	1876,2	1956,2	3752,4	3912,4	736	1895,0	1975,0	3790,0	3950,0					
549	1857,6	1937,6	3715,2	3875,2	643	1876,4	1956,4	3752,8	3912,8	737	1895,2	1975,2	3790,4	3950,4					
550	1857,8	1937,8	3715,6	3875,6	644	1876,6	1956,6	3753,2	3913,2	738	1895,4	1975,4	3790,8	3950,8					
551	1858,0	1938,0	3716,0	3876,0	645	1876,8	1956,8	3753,6	3913,6	739	1895,6	1975,6	3791,2	3951,2					
552	1858,2	1938,2	3716,4	3876,4	646	1877,0	1957,0	3754,0	3914,0	740	1895,8	1975,8	3791,6	3951,6					
553	1858,4	1938,4	3716,8	3876,8	647	1877,2	1957,2	3754,4	3914,4	741	1896,0	1976,0	3792,0	3952,0					
554	1858,6	1938,6	3717,2	3877,2	648	1877,4	1957,4	3754,8	3914,8	742	1896,2	1976,2	3792,4	3952,4					
555	1858,8	1938,8	3717,6	3877,6	649	1877,6	1957,6	3755,2	3915,2	743	1896,4	1976,4	3792,8	3952,8					
556	1859,0	1939,0	3718,0	3878,0	650	1877,8	1957,8	3755,6	3915,6	744	1896,6	1976,6	3793,2	3953,2					
557	1859,2	1939,2	3718,4	3878,4	651	1878,0	1958,0	3756,0	3916,0	745	1896,8	1976,8	3793,6	3953,6					
558	1859,4	1939,4	3718,8	3878,8	652	1878,2	1958,2	3756,4	3916,4	746	1897,0	1977,0	3794,0	3954,0					
559	1859,6	1939,6	3719,2	3879,2	653	1878,4	1958,4	3756,8	3916,8	747	1897,2	1977,2	3794,4	3954,4					
560	1859,8	1939,8	3719,6	3879,6	654	1878,6	1958,6	3757,2	3917,2	748	1897,4	1977,4	3794,8	3954,8					
561	1860,0	1940,0	3720,0	3880,0	655	1878,8	1958,8	3757,6	3917,6	749	1897,6	1977,6	3795,2	3955,2					
562	1860,2	1940,2	3720,4	3880,4	656	1879,0	1959,0	3758,0	3918,0	750	1897,8	1977,8	3795,6	3955,6					
563	1860,4	1940,4	3720,8	3880,8	657	1879,2	1959,2	3758,4	3918,4	751	1898,0	1978,0	3796,0	3956,0					
564	1860,6	1940,6	3721,2	3881,2	658	1879,4	1959,4	3758,8	3918,8	752	1898,2	1978,2	3796,4	3956,4					
565	1860,8	1940,8	3721,6	3881,6	659	1879,6	1959,6	3759,2	3919,2	753	1898,4	1978,4	3796,8	3956,8					
566	1861,0	1941,0	3722,0	3882,0	660	1879,8	1959,8	3759,6	3919,6	754	1898,6	1978,6	3797,2	3957,2					
567	1861,2	1941,2	3722,4	3882,4	661	1880,0	1960,0	3760,0	3920,0	755	1898,8	1978,8	3797,6	3957,6					
568	1861,4	1941,4	3722,8	3882,8	662	1880,2	1960,2	3760,4	3920,4	756	1899,0	1979,0	3798,0	3958,0					
569	1861,6	1941,6	3723,2	3883,2	663	1880,4	1960,4	3760,8	3920,8	757	1899,2	1979,2	3798,4	3958,4					
570	1861,8	1941,8	3723,6	3883,6	664	1880,6	1960,6	3761,2	3921,2	758	1899,4	1979,4	3798,8	3958,8					
571	1862,0	1942,0	3724,0	3884,0	665	1880,8	1960,8	3761,6	3921,6	759	1899,6	1979,6	3799,2	3959,2					
572	1862,2	1942,2	3724,4	3884,4	666	1881,0	1961,0	3762,0	3922,0	760	1899,8	1979,8	3799,6	3959,6					
573	1862,4	1942,4	3724,8	3884,8	667	1881,2	1961,2	3762,4	3922,4	761	1900,0	1980,0	3800,0	3960,0					
574	1862,6	1942,6	3725,2	3885,2	668	1881,4	1961,4	3762,8	3922,8	762	1900,2	1980,2	3800,4	3960,4					
575	1862,8	1942,8	3725,6	3885,6	669	1881,6	1961,6	3763,2	3923,2	763	1900,4	1980,4	3800,8	3960,8					
576	1863,0	1943,0	3726,0	3886,0	670	1881,8	1961,8	3763,6	3923,6	764	1900,6	1980,6	3801,2	3961,2					
577	1863,2	1943,2	3726,4	3886,4	671	1882,0	1962,0	3764,0	3924,0	765	1900,8	1980,8	3801,6	3961,6					
578	1863,4	1943,4	3726,8	3886,8	672	1882,2	1962,2	3764,4	3924,4	766	1901,0	1981,0	3802,0	3962,0					
579	1863,6	1943,6	3727,2	3887,2	673	1882,4	1962,4	3764,8	3924,8	767	1901,2	1981,2	3802,4	3962,4					
580	1863,8	1943,8	3727,6	3887,6	674	1882,6	1962,6	3765,2	3925,2	768	1901,4	1981,4	3802,8	3962,8					
581	1864,0	1944,0	3728,0	3888,0	675	1882,8	1962,8	3765,6	3925,6	769	1901,6	1981,6	3803,2	3963,2					
582	1864,2	1944,2	3728,4	3888,4	676	1883,0	1963,0	3766,0	3926,0	770	1901,8	1981,8	3803,6	3963,6					
583	1864,4	1944,4	3728,8	3888,8	677	1883,2	1963,2	3766,4	3926,4	771	1902,0	1982,0	3804,0	3964,0					
584	1864,6	1944,6	3729,2	3889,2	678	1883,4	1963,4	3766,8	3926,8	772	1902,2	1982,2	3804,4	3964,4					
585	1864,8	1944,8	3729,6	3889,6	679	1883,6	1963,6	3767,2	3927,2	773	1902,4	1982,4	3804,8	3964,8					
586	1865,0	1945,0	3730,0	3890,0	680	1883,8	1963,8	3767,6	3927,6	774	1902,6	1982,6	3805,2	3965,2					
587	1865,2	1945,2	3730,4	3890,4	681	1884,0	1964,0	3768,0	3928,0	775	1902,8	1982,8	3805,6	3965,6					
588	1865,4	1945,4	3730,8	3890,8	682	1884,2	1964,2	3768,4	3928,4	776	1903,0	1983,0	3806,0	3966,0					
589	1865,6	1945,6	3731,2	3891,2	683	1884,4	1964,4	3768,8	3928,8	777	1903,2	1983,2	3806,4	3966,4					
590	1865,8	1945,8	3731,6	3891,6	684	1884,6	1964,6	3769,2	3929,2	778	1903,4	1983,4	3806,8	3966,8					
591	1866,0	1946,0	3732,0	3892,0	685	1884,8	1964,8	3769,6	3929,6	779	1903,6	1983,6	3807,2	3967,2					
592	1866,2	1946,2	3732,4	3892,4	686	1885,0	1965,0	3770,0	3930,0	780	1903,8	1983,8	3807,6	3967,6					
593	1866,4	1946,4	3732,8	3892,8	687	1885,2	1965,2	3770,4	3930,4	781	1904,0	1984,0	3808,0	3968,0					
594	1866,6	1946,6	3733,2	3893,2	688	1885,4	1965,4	3770,8	3930,8	782	1904,2	1984,2	3808,4	3968,4					
595	1866,8	1946,8	3733,6	3893,6	689	1885,6	1965,6	3771,2	3931,2	783	1904,4	1984,4	3808,8	3968,8					
596	1867,0	1947,0	3734,0	3894,0	690	1885,8	1965,8	3771,6	3931,6	784	1904,6	1984,6	3809,2	3969,2					
597	1867,2	1947,2	3734,4	3894,4	691	1886,0	1966,0	3772,0	3932,0	785	1904,8	1984,8	3809,6	3969,6					
598	1867,4	1947,4	3734,8	3894,8	692	1886,2	1966,2	3772,4	3932,4	786	1905,0	1985,0	3810,0	3970,0					
599	1867,6	1947,6	3735,2	3895,2	693	1886,4	1966,4	3772,8	3932,8	787	1905,2	1985,2	3810,4	3970,4					
600	1867,8	1947,8	3735,6	3895,6	694	1886,6	1966,6	3773,2	3933,2	788	1905,4	1985,4	3810,8	3970,8					
601	1868,0	1948,0	3736,0	3896,0	695	1886,8	1966,8	3773,6	3933,6	789	1905,6	1985,6	3811,2	3971,2					
602	1868,2	1948,2	3736,4	3896,4	696	1887,0	1967,0	3774,0	3934,0	790	1905,8	1985,8	3811,6	3971,6					
603	1868,4	1948,4	3736,8	3896,8	697	1887,2	1967,2	3774,4	3934,4	791	1906,0	1986,0	3812,0	3972,0					
604	1868,6	1948,6	3737,2	3897,2	698	1887,4	1967,4	3774,8	3934,8	792	1906,2	1986,2	3812,4	3972,4					
605	1868,8	1948,8	3737,6	3897,6	699	1887,6	1967,6	3775,2	3935,2	793	1906,4	1986,4	3812,8	3972,8					

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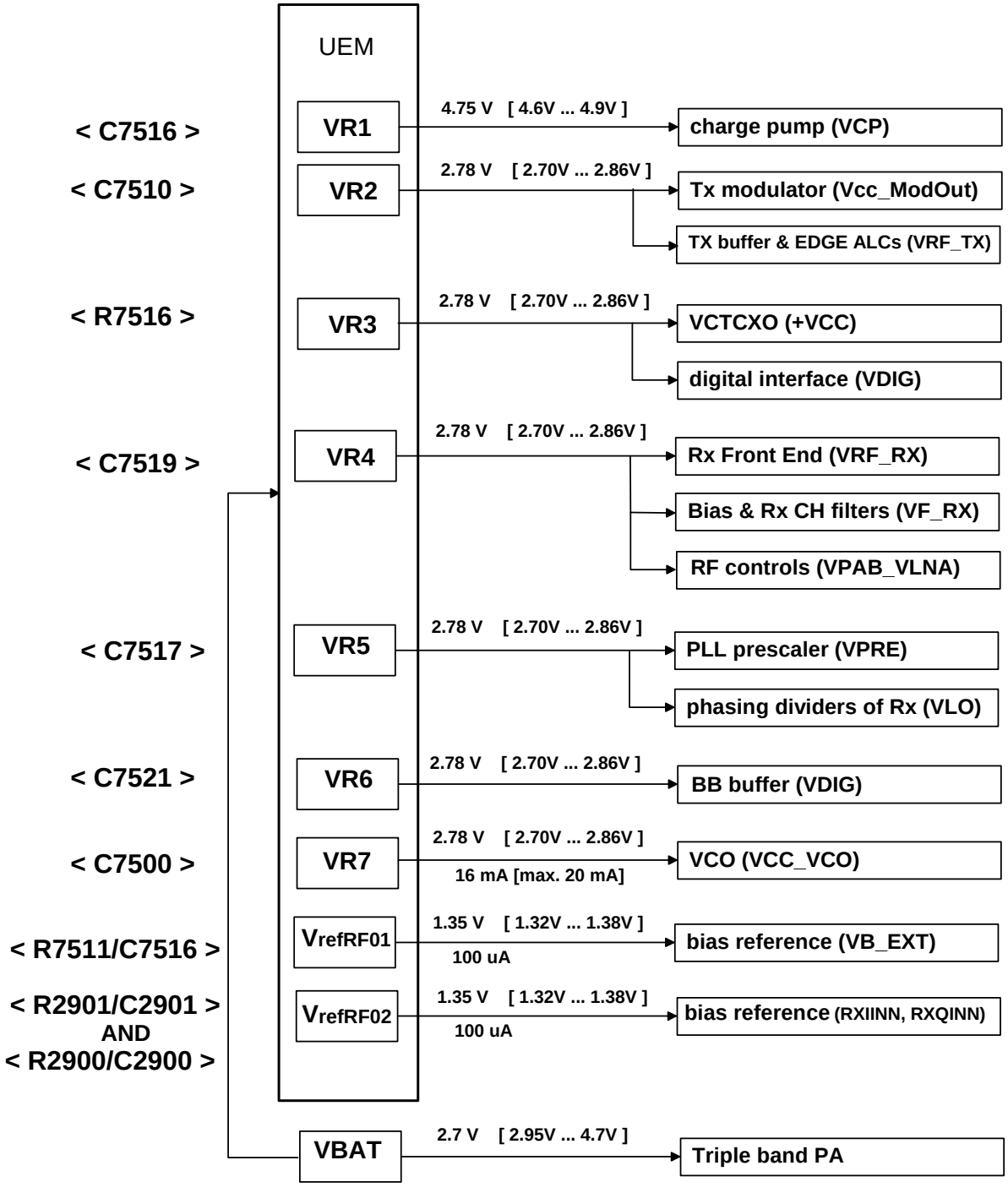
DC Supply Voltage Check

For a quick check of DC power supplies, refer to the diagram below. The RF power supplies are generated in the UEM and can be measured either in the Small Signal Chamber or in the Base Band Chamber.

The UEM output voltages can be measured at the respective resistors' / capacitors' pads marked below in brackets, e.g. < C1234 >.



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Appendix 6A: Test Points

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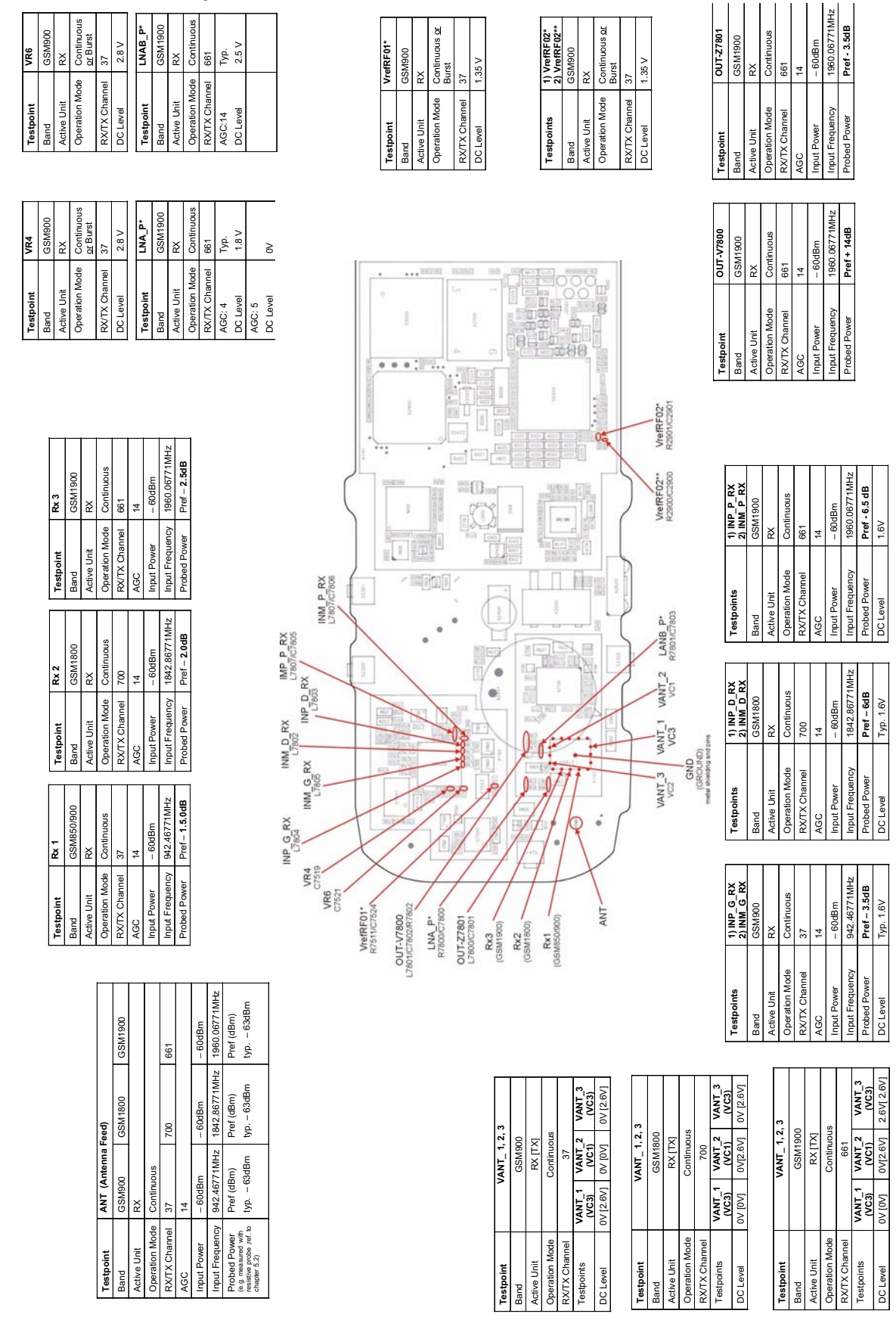
Receiver test points



Testpoint	VR4
Band	GSM900
Active Unit	RX
Operation Mode	Continuous or Burst
RX/TX Channel	37
DC Level	2.8 V

Testpoint	LNA_P*
Band	GSM1900
Active Unit	RX
Operation Mode	Continuous
RX/TX Channel	661
AGC: 4	Typ.
DC Level	1.8 V
AGC: 5	
DC Level	0V

Testpoint	VR6
Band	GSM900
Active Unit	RX
Operation Mode	Continuous or Burst
RX/TX Channel	37
DC Level	2.8 V

Testpoint	LNAB_P*
Band	GSM1900
Active Unit	RX
Operation Mode	Continuous
RX/TX Channel	661
AGC:14	Typ.
DC Level	2.5 V

Testpoint	Rx 1
Band	GSM850/900
Active Unit	RX
Operation Mode	Continuous
RX/TX Channel	37
AGC	14
Input Power	– 60dBm
Input Frequency	942.467711MHz
Probed Power	Pref – **1.5.0dB**

Testpoint	Rx 2
Band	GSM1800
Active Unit	RX
Operation Mode	Continuous
RX/TX Channel	700
AGC	14
Input Power	– 60dBm
Input Frequency	1842.867711MHz
Probed Power	Pref – **2.0dB**

Testpoint	Rx 3
Band	GSM1900
Active Unit	RX
Operation Mode	Continuous
RX/TX Channel	661
AGC	14
Input Power	– 60dBm
Input Frequency	1960.067711MHz
Probed Power	Pref – **2.5dB**

Testpoint	VrefRF01*
Band	GSM900
Active Unit	RX
Operation Mode	Continuous or Burst
RX/TX Channel	37
DC Level	1.35 V

Testpoints	1) VrefRF02* 2) VrefRF02**
Band	GSM900
Active Unit	RX
Operation Mode	Continuous or Burst
RX/TX Channel	37
DC Level	1.35 V

Testpoint	OUT-V7800
Band	GSM1900
Active Unit	RX
Operation Mode	Continuous
RX/TX Channel	661
AGC	14
Input Power	– 60dBm
Input Frequency	1960.067711MHz
Probed Power	**Pref + 14dB**

Testpoint	OUT-Z7801
Band	GSM1900
Active Unit	RX
Operation Mode	Continuous
RX/TX Channel	661
AGC	14
Input Power	– 60dBm
Input Frequency	1960.067711MHz
Probed Power	**Pref - 3.5dB**

Testpoints	1) INP_P_RX 2) INM_P_RX
Band	GSM1900
Active Unit	RX
Operation Mode	Continuous
RX/TX Channel	661
AGC	14
Input Power	– 60dBm
Input Frequency	1960.067711MHz
Probed Power	**Pref - 6.5 dB**
DC Level	1.6V

Testpoints	1) INP_D_RX 2) INM_D_RX
Band	GSM1800
Active Unit	RX
Operation Mode	Continuous
RX/TX Channel	700
AGC	14
Input Power	– 60dBm
Input Frequency	1842.867711MHz
Probed Power	**Pref – 6dB**
DC Level	Typ. 1.6V

Testpoints	1) INP_G_RX 2) INM_G_RX
Band	GSM900
Active Unit	RX
Operation Mode	Continuous
RX/TX Channel	37
AGC	14
Input Power	– 60dBm
Input Frequency	942.467711MHz
Probed Power	**Pref – 3.5dB**
DC Level	Typ. 1.6V

Testpoint	ANT (Antenna Feed)		
Band	GSM900	GSM1800	GSM1900
Active Unit	RX		
Operation Mode	Continuous		
RX/TX Channel	37	700	661
AGC	14		
Input Power	– 60dBm	– 60dBm	– 60dBm
Input Frequency	942.467711MHz	1842.867711MHz	1960.067711MHz
Probed Power (to be probed with resistive probe, ref. to chapter 5.2)	Pref (dBm) typ. – 63dBm	Pref (dBm) typ. – 63dBm	Pref (dBm) typ. – 63dBm

Testpoint	VANT_1, 2, 3		
Band	GSM900		
Active Unit	RX [TX]		
Operation Mode	Continuous		
RX/TX Channel	37		
Testpoints	**VANT_1 (VC3)**	**VANT_2 (VC1)**	**VANT_3 (VC2)**
DC Level	0V [2.6V]	0V [0V]	0V [2.6V]

Testpoint	VANT_1, 2, 3		
Band	GSM1800		
Active Unit	RX [TX]		
Operation Mode	Continuous		
RX/TX Channel	700		
Testpoints	**VANT_1 (VC3)**	**VANT_2 (VC1)**	**VANT_3 (VC2)**
DC Level	0V [2.6V]	0V [0V]	0V [2.6V]

Testpoint	VANT_1, 2, 3		
Band	GSM1900		
Active Unit	RX [TX]		
Operation Mode	Continuous		
RX/TX Channel	661		
Testpoints	**VANT_1 (VC3)**	**VANT_2 (VC1)**	**VANT_3 (VC2)**
DC Level	0V [0V]	0V [2.6V]	2.6V [2.6V]

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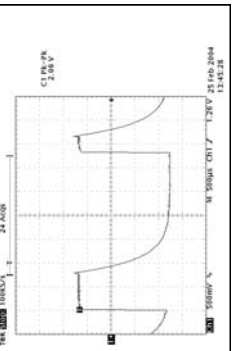
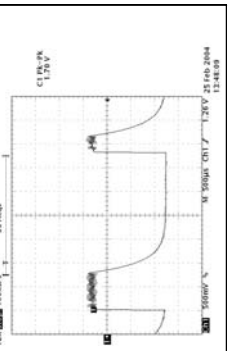
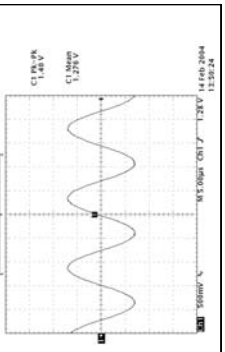
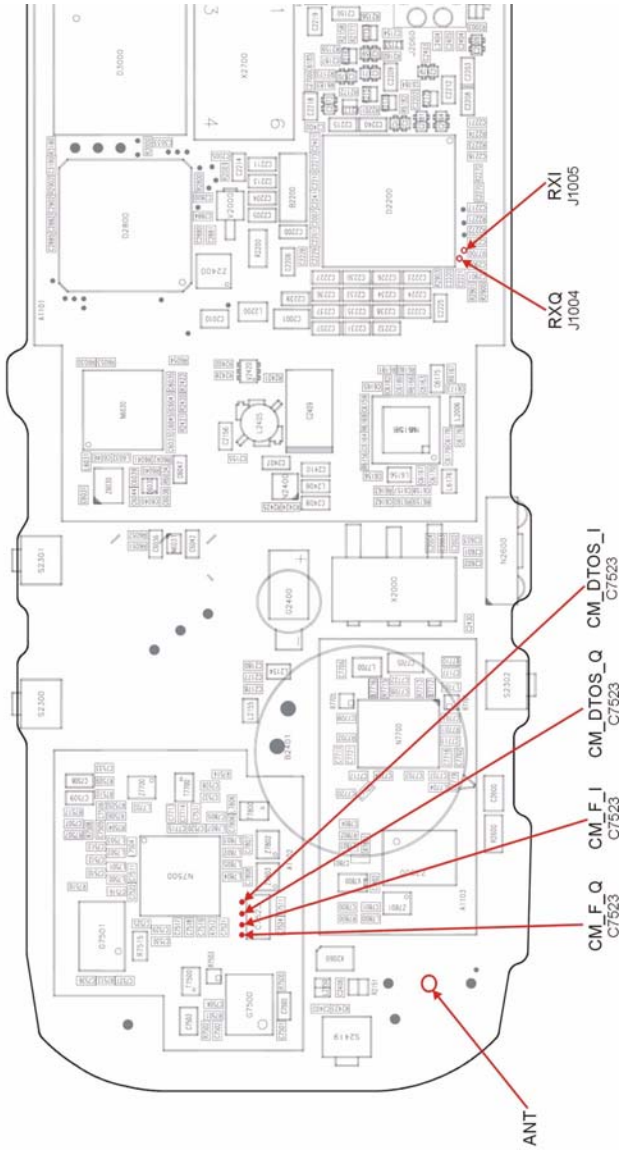
Testpoints	1) CM_DTOS_I 2) CM_DTOS_Q
Band	GSM900 or GSM1800 or GSM1900
Active Unit	RX
Operation Mode	Burst
RX/TX Channel	37 or 700 or 661
AGC	14
Input Power	– 60dBm
Input Frequency	942.46771, 1842.86771 or 1960.067711MHz
Signal Amplitude	Approx. 2 Vpp
Graph (typical for both TPs and all bands)	

Testpoints	1) CM_F_I 2) CM_F_Q
Band	GSM900 or GSM1800 or GSM1900
Active Unit	RX
Operation Mode	Burst
RX/TX Channel	37 or 700 or 661
AGC	10
Input Power	– 60dBm
Input Frequency	942.46771, 1842.86771 or 1960.067711MHz
Signal Amplitude	Approx. 1.75 Vpp
Graph (typical for both TPs and all bands)	

Testpoints	1) RXI 2) RXQ
Band	GSM900 or GSM1800 or GSM1900
Active Unit	RX
Operation Mode	Continuous
RX/TX Channel	37 or 700 or 661
AGC	10
Input Power	– 60dBm
Input Frequency	942.46771, 1842.86771 or 1960.067711MHz
Signal Amplitude	1.4Vpp
DC Offset	1.28Vdc
Frequency	67kHz
Graph (typical for all TPs and bands)	



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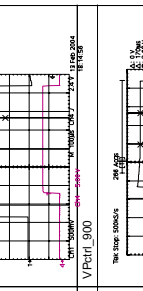
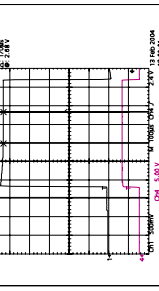
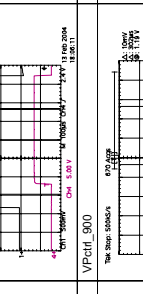
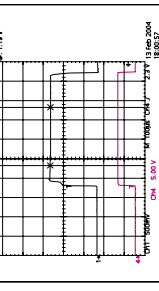
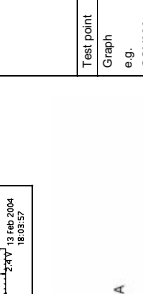
Transmitter test points

Testpoints	TXIP (R713/1) TXIM (R713/2) TXIP (R713/7) TXQM (R713/5))
Band	GSM 850 or 900 or GSM1800 or GSM1900
Active Unit	TX
Operation Mode	Burst
RX/TX Channel	190 or 37 or 700 or 661
Tx Data Type	Random
Tx Power Level	any
Signal Amplitude	520mVpp
DC Offset	1.2Vdc
Graph (typical for all TPs and bands)	

Modulation	GMSK (EDGE = OFF)	8-PSK (EDGE = ON)
Band	GSM 850 or 900 or 1800 or 1900	GSM 850 or 900 or 1800 or 1900
Active Unit	TX	TX
Operation Mode	Burst	Burst
Test point	TXC	TXC
Graph e.g. GSM900 PL10		
Test point	VTXB_900	VTXB_900
Graph e.g. GSM900 PL10		
Test point	VPCtrl_900	VPCtrl_900
Graph e.g. GSM900 PL10		
Test point	VDET	

Testpoint	VREF01
Band	GSM900
Active Unit	TX
Operation Mode	Burst
RX/TX Channel	37
DC Level	1.35V

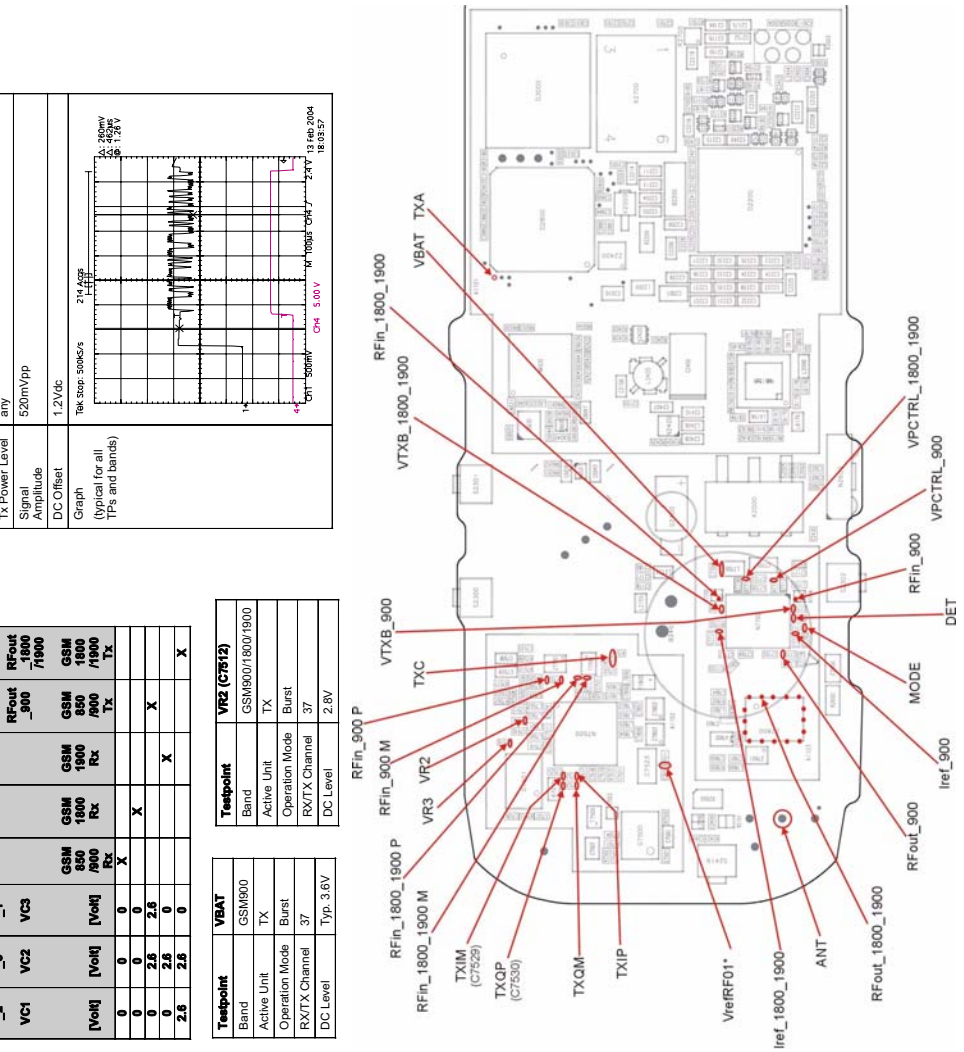
Testpoint	VR3
Band	GSM900
Active Unit	TX
Operation Mode	Burst
RX/TX Channel	37
DC Level	2.8V

Transmitter Test Points (1/3)

Matrix Antenna Switch Module Z7800 *Test points: RFout_900 and RFout_1800/1900*										
VANT_2 VC1 [Volt]	VANT_3 VC2 [Volt]	VANT_1 VC3 [Volt]	Rx1 GSM 850 /900 Rx	Rx2 GSM 1800 Rx	Rx3 GSM 1900 Rx	Tx1 RFout_900 GSM 850 /900 Tx	Tx2 RFout_1800 /1900 GSM 1800 /1900 Tx
0	0	0	X				
0	0	2.6		X			
0	2.6	0			X	X	
2.6	2.6	0					X

Testpoint	VBAT
Band	GSM900
Active Unit	TX
Operation Mode	Burst
RX/TX Channel	37
DC Level	Typ. 3.6V

Testpoint	VR2 (C7512)
Band	GSM900/1800/1900
Active Unit	TX
Operation Mode	Burst
RX/TX Channel	37
DC Level	2.8V



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Power measurements at the test points by means of a probe with 470 (!) Ohms at the peak only. Gains or losses of the key components detected with the probe shall be comparable to the measurement with the 50 Ohms power measurement.

Testpoint	RF @ Test-Jig
Band	GSM 850 or 900
Active Unit	TX
Operation Mode	Burst
Modulation	GMSK (Edge=off)
RX/TX Channel	190 or 37
Tx Power Level	10
Tx Data Type	All 1
Power @ 50 Ohm Losses of jig compensated	Typ. +23dBm

Testpoint	ANT
Band	GSM 850 or 900
Active Unit	TX
Operation Mode	Burst
Modulation	GMSK (Edge=off)
RX/TX Channel	190 or 37
Tx Power Level	10
Tx Data Type	All 1
Power @ 50 Ohms	+23 dBm
Power @ probe	+ dBm

Testpoint	RFout_900
Band	GSM 850 or 900
Active Unit	TX
Operation Mode	Burst
Modulation	GMSK (Edge=off)
RX/TX Channel	190 or 37
Tx Power Level	10
Tx Data Type	All 1
Power @ 50 Ohms	+24.3 dBm
Power @ probe	+ dBm

Testpoint	RFin_900
Band	GSM 850 or 900
Active Unit	TX
Operation Mode	Burst
Modulation	GMSK (Edge=off)
RX/TX Channel	190 or 37
Tx Power Level	10
Tx Data Type	All 1
Power @ 50 Ohms	+2 dBm
Power @ probe	+ dBm

Testpoint	1. RFin_900P 2. RFin_900M
Band	GSM 850 or 900
Active Unit	TX
Operation Mode	Burst
Modulation	GMSK (Edge=off)
RX/TX Channel	190 or 37
Tx Power Level	10
Tx Data Type	All 1
Power @ 50 Ohms	+2 dBm
Power @ probe	+ dBm

Testpoint	ANT
Band	GSM 1800 or 1900
Active Unit	TX
Operation Mode	Burst
Modulation	GMSK (Edge=off)
RX/TX Channel	700 or 661
Tx Power Level	5
Tx Data Type	All 1
Power @ 50 Ohms	+ 20 dBm
Power @ probe	+ dBm

Testpoint	RFout_1800_1900
Band	GSM 1800 or 1900
Active Unit	TX
Operation Mode	Burst
Modulation	GMSK (Edge=off)
RX/TX Channel	700 or 661
Tx Power Level	5
Tx Data Type	All 1
Power @ 50 Ohms	+ 21.6 dBm
Power @ probe	+ dBm

Testpoint	RFin_1800_1900
Band	GSM 1800 or 1900
Active Unit	TX
Operation Mode	Burst
Modulation	GMSK (Edge=off)
RX/TX Channel	700 or 661
Tx Power Level	5
Tx Data Type	All 1
Power @ 50 Ohms	+ 2 dBm
Power @ probe	+ dBm

Testpoint	1. RFin_1800_1900P 2. RFin_1800_1900M
Band	GSM 1800 or 1900
Active Unit	TX
Operation Mode	Burst
Modulation	GMSK (Edge=off)
RX/TX Channel	700 or 661
Tx Power Level	5
Tx Data Type	All 1
Power @ 50 Ohms	+ 0 dBm
Power @ probe	+ dBm

Testpoint	RF @ Test-Jig
Band	GSM 1800 or 1900
Active Unit	TX
Operation Mode	Burst
Modulation	GMSK (Edge=off)
RX/TX Channel	700 or 661
Tx Power Level	5
Tx Data Type	All 1
Power @ 50 Ohms Losses of jig compensated	Typ.+ 20 dBm

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Power measurements at the test points by means of a probe with 470 (!) Ohms at the peak only. Gains or losses of the key components detected with the probe shall be comparable to the measurement with the 50 Ohms power measurement.

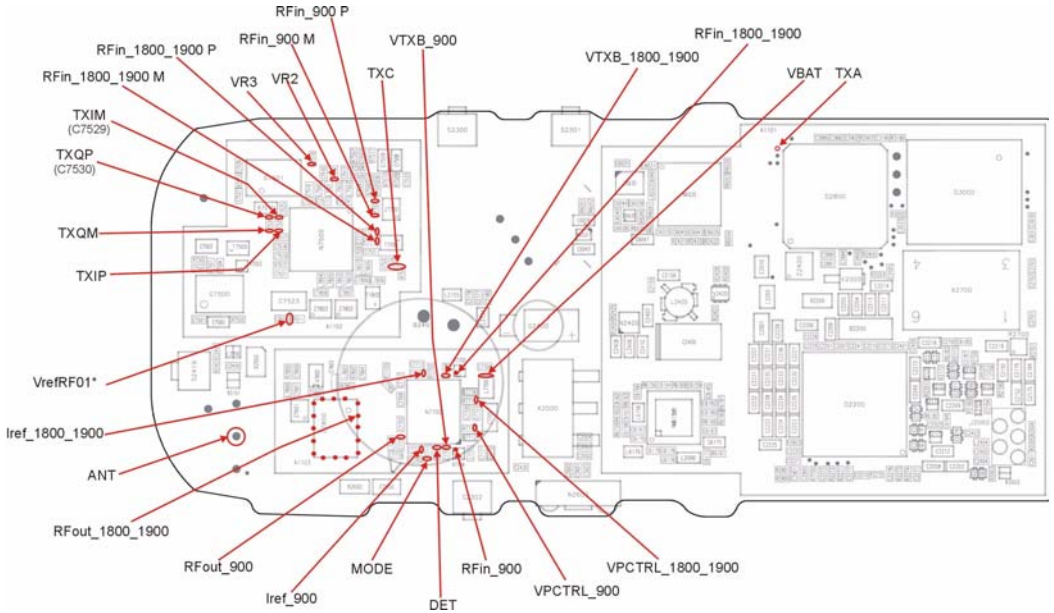
Testpoint	RF @ Test-Jig
Band	GSM 850 or 900
Active Unit	TX
Operation Mode	Burst
Modulation	8-PSK (Edge=on)
RX/TX Channel	190 or 37
Tx Power Level	10
Tx Data Type	All 1
Power @ 50 Ohms Losses of jig compensated	**Typ. +24.5dBm**

Testpoint	ANT
Band	GSM 850 or 900
Active Unit	TX
Operation Mode	Burst
Modulation	8-PSK (Edge=on)
RX/TX Channel	190 or 37
Tx Power Level	10
Tx Data Type	All 1
Power @ 50 Ohms	**+ 24.5 dBm**
Power @ probe	**+ dBm**

Testpoint	RFout_900
Band	GSM 850 or 900
Active Unit	TX
Operation Mode	Burst
Modulation	8-PSK (Edge=on)
RX/TX Channel	190 or 37
Tx Power Level	10
Tx Data Type	All 1
Power @ 50 Ohms	**+ 25.8 dBm**
Power @ probe	**+ dBm**

Testpoint	RFin_900
Band	GSM 850 or 900
Active Unit	TX
Operation Mode	Burst
Modulation	8-PSK (Edge=on)
RX/TX Channel	190 or 37
Tx Power Level	10
Tx Data Type	All 1
Power @ 50 Ohms	**-15 … - 8 dBm**
Power @ probe	**dBm**

Testpoint	1. RFin_900P 2. RFin_900M
Band	GSM 850 or 900
Active Unit	TX
Operation Mode	Burst
Modulation	8-PSK (Edge=on)
RX/TX Channel	190 or 37
Tx Power Level	10
Tx Data Type	All 1
Power @ 50 Ohms	**- 15 … - 8 dBm**
Power @ probe	**dBm**



Testpoint	MODE
Band	GSM850/900/1800/1900
Active Unit	TX
Operation Mode	Burst
Modulation	8-PSK (Edge=on)
RX/TX Channel	190 or 37 or 700 or 661
Tx Power Level	10
Tx Data Type	All 1
Voltage	1.96 V (Burst)

Testpoint	Iref_900 BOM1, BOM2, BOM2b
Band	***GSM 850 or 900***
Active Unit	TX
Operation Mode	Burst
Modulation	8-PSK (Edge=on)
RX/TX Channel	190 or 37
Tx Power Level	10
Tx Data Type	All 1
Voltage	1.92 V (Burst)

Testpoint	Iref_1800_1900 (BOM1) Iref_900 (BOM2, BOM2b)
REMARK	Use same testpoint Iref_900 for higher GSM bands in case of BOM2 and BOM2b !
Band	***GSM 1800 or 1900***
Active Unit	TX
Operation Mode	Burst
Modulation	8-PSK (Edge=on)
RX/TX Channel	700 or 661
Tx Power Level	10
Tx Data Type	All 1
Voltage	2.0 V (Burst)

Testpoint	RF @ Test-Jig
Band	GSM 1800 or 1900
Active Unit	TX
Operation Mode	Burst
Modulation	8-PSK (Edge=on)
RX/TX Channel	700 or 661
Tx Power Level	5
Tx Data Type	All 1
Power @ 50 Ohms Losses of jig compensated	**+ 21.5 dBm**

Testpoint	ANT
Band	GSM 1800 or 1900
Active Unit	TX
Operation Mode	Burst
Modulation	8-PSK (Edge=on)
RX/TX Channel	700 or 661
Tx Power Level	5
Tx Data Type	All 1
Power @ 50 Ohms	**+ 21.5 dBm**
Power @ probe	**+ dBm**

Testpoint	RFout_1800_1900
Band	GSM 1800 or 1900
Active Unit	TX
Operation Mode	Burst
Modulation	8-PSK (Edge=on)
RX/TX Channel	700 or 661
Tx Power Level	5
Tx Data Type	All 1
Power @ 50 Ohms	**+ 23.1 dBm**
Power @ probe	**+ dBm**

Testpoint	RFin_1800_1900
Band	GSM 1800 or 1900
Active Unit	TX
Operation Mode	Burst
Modulation	8-PSK (Edge=on)
RX/TX Channel	700 or 661
Tx Power Level	5
Tx Data Type	All 1
Power @ 50 Ohms	**- 16 … - 8 dBm**
Power @ probe	**dBm**

Testpoint	1. RFin_1800_1900P 2. RFin_1800_1900M
Band	GSM 1800 or 1900
Active Unit	TX
Operation Mode	Burst
Modulation	8-PSK (Edge=on)
RX/TX Channel	700 or 661
Tx Power Level	5
Tx Data Type	All 1
Power @ 50 Ohms	**- 18 … - 10 dBm**
Power @ probe	**dBm**

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Synthesizer test points

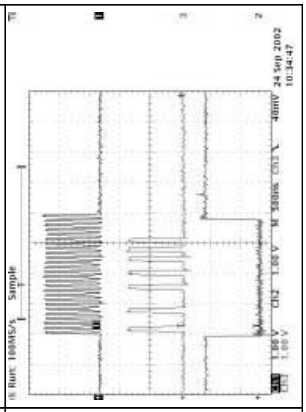
Testpoint	VR3	VR5	VR7
Band	default (GSM900 or GSM850)		
Active Unit	Rx		
Operation Mode	Burst or Continuous		
RX/TX Channel	default		
DC Level	2.78V	2.78V	2.78V

Testpoint	VR1	VrefRF01	VrefRF02
Band	default (GSM900 or GSM850)		
Active Unit	Rx		
Operation Mode	Burst or Continuous		
RX/TX Channel	default		
DC Level	4.76	1.35V	1.35V

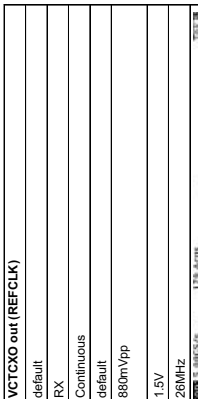
Testpoint	AFC (Vc of VCTCXO)
Band	default
Active Unit	RX
Operation Mode	Continuous
RX/TX Channel	any
AFC (value)	-1024 / 150 / 1023
AFC voltage	0.1V / 1.4V / 2.5V

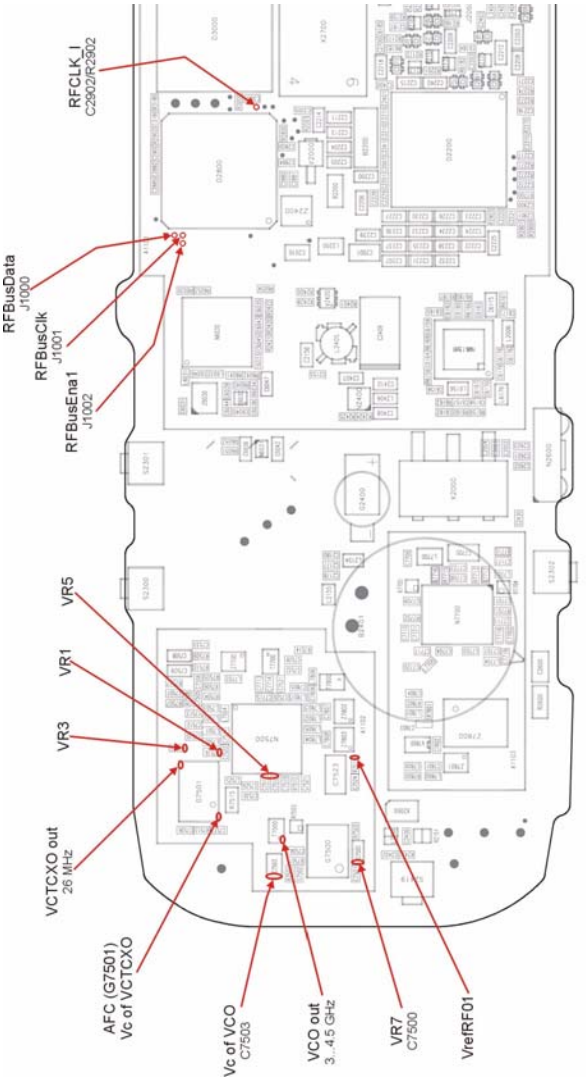
Testpoint	Vc of VCO		
Band	GSM1800	GSM1900	GSM1900
Active Unit	TX	TX	RX
Operation Mode	Continuous		
RX/TX Channel	512	512	810
Frequency	3420.4MHz	3700.4MHz	3979.6MHz
DC Level	~ 1.3V	~ 2.5V	~ 3.6V
Note	Take care to select the highest PCL 15 if activating TX Continuous mode, otherwise the power amplifier will be destroyed.		

Testpoint	VCOout		
Band	GSM1800	GSM1900	GSM1900
Active Unit	TX	TX	RX
Operation Mode	Continuous		
RX/TX Channel	512	512	810
Frequency	3420.4MHz	3700.4MHz	3979.6MHz
Level (spec. range = -3.5...+2.5dBm)	~ 0dBm	~ 0dBm	~ 0dBm
Notes	Measured using the special probe with capacitive coupling. No exact power measurement possible. Take care to select the highest PCL 15 if activating TX Continuous mode, otherwise the power amplifier will be destroyed.		

Testpoint	RFBusClk, RFBusData, RFBusEna1
Band	default (GSM900 or GSM850)
Active Unit	RX
Operation Mode	Burst
RX/TX Channel	default
Signal Amplitude	~2V
Graph	
RFBusClk	
RFBusData	
RFBusEna1	

Synthesizer Test Points (1/1)

Testpoint	VCTCXO out (REFCLK)
Band	default
Active Unit	RX
Operation Mode	Continuous
RX/TX Channel	default
Signal Amplitude	880mVpp
DC Offset	1.5V
Frequency	26MHz
Graph	
	measured with passive probe 10x, 10Mohm/8pF, AC coupled)



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